Tirupati Smart City Corporation Limited

REF: TSCCL/Projects/16(Master System Integrator)/2018

Request for Proposal to implement Pan City ICT Solutions and Design and Construction of City Operations Centre (COC) Building IN Tirupati

Dated: 20 July 2018

2 (b)
Scope of Work

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Schedule A - Site of the Project

(See Clause 20.0)

The proposed Iconic COC Building Complex is one of the project module identified under Area based development (ABD) projects within the Tirupati Smart City Project. This building will house Tirupati's state-of-the-art City Operations Centre (COC), which is at the core of its pan-city proposal.

1. The COC Building Site

a. Site of the City Operations Centre is as described in Annexure-I of this Schedule-A.
b. The dates of handing over the Site to the MSI are specified in Annexure-II of this Schedule-A.
c. An inventory of the Site including trees, building and any other immovable property on, or attached to, the Site shall be prepared jointly by the Client's Representative and the MSI, and such inventory shall form part of the Agreement. Annexure-III
d. The status of the Environment clearances is given in Annexure-IV.

2. The Smart Bus Stops Site

a. Site of the smart bus stops shall be spread across Tirupati city is as described in map in annexure IV- (a).

Annexure I- COC Building Site

(Schedule A)

1. COC Building Site

The designated site currently houses the Municipal Corporation of Tirupati Office Complex. The ownership of land is with Municipal Corporation of Tirupati. This land is proposed to be utilized for the Construction of COC building post demolition and clearance of the existing structures.

In lieu of the land being provided by MCT for the construction of COC building with world-class features, it is envisaged that suitable space will be given in the said building for housing Municipal Corporation Officers and Staff. This is expected to improve the overall Governance and efficiency of City Administration and Management which is in line with the vision of Tirupati Smart City.

This would further facilitate tapping into the existing as well as proposed infrastructure like power, water, storm water drain, along with road. This location is strategic, in terms of visibility, future availability of infrastructure and connectivity, being at the City Centre which is Key for an Iconic Building of this Stature.

The site for COC building lies within the following coordinates:

Points	Easting	Northing
A	79.2520	13.3810
B	79.2523	13.3808
C	79.4239	13.6369
D	79.4229	13.6370

Index Maps and Location Maps of the project are given at Appendix A-1.

a. Seismicity

The Tirupati Municipal Area falls under the Zone III of the Seismic zoning map of India – IS: 1893-2002.

2. Existing Features and Utilities / Services

The site is currently holding Municipal office, Meeting hall and other municipal Functions and has exiting utilities like electrical and water supply lines. MSI has to ascertain and the level of utilities and shifting during construction activities.

Annexure II – Land Details

(Schedule-A)

1. **Existing Land Ownership**
   The existing land belongs to Municipal Corporation of Tirupati.
2. **Land Use (as per draft Landuse plan – 2035)**
   The proposed land use of site as per draft Development Plan is Public and Semi Public.
3. **Handing over site to the MSI**

   Details of handing over of Site to MSI are given in table below:

S. No.	Site Details
1	The size of the plot available for the construction is 14,392 SQ.M. The site abuts 24m wide Tilak road on western side, 18m wide Korlagunta Road on north western side and is approachable from 12m wide secondary road at eastern side.

Annexure III – Draft Town Planning Scheme and Development Plan

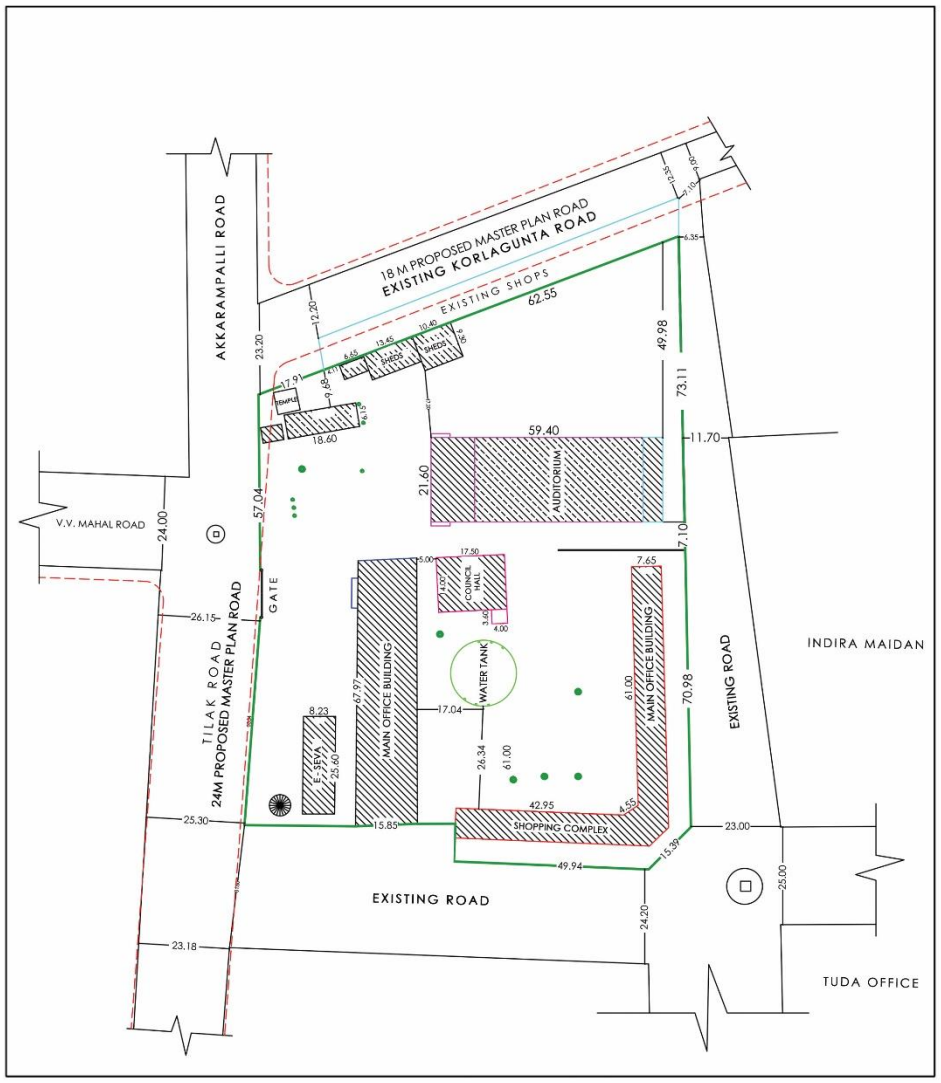
(Schedule-A)

1. City Operation Centre (COC) superimposed over Draft Development Plan (land use plan) is shown below;

Annexure IV – Site Topography

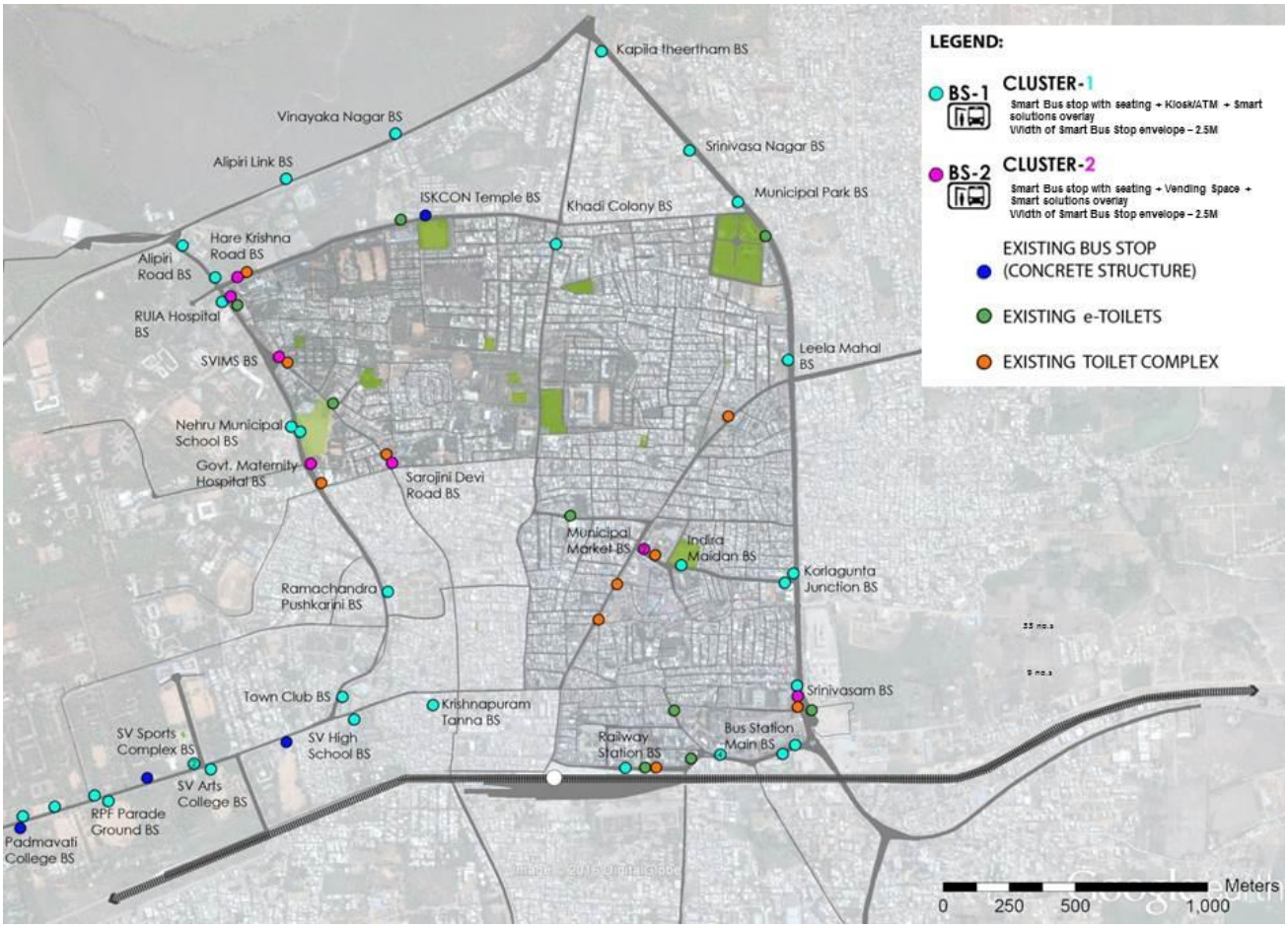
(Schedule-A)

1. The COC building site is topographically flat with gentle slope from north to south. There are existing trees, natural drain channels or electric LT/HT lines on the site.



MUNICIPAL CORPORATION, TIRUPATI
SITE PLAN SHOWING THE EXISTING MUNICIPAL OFFICE BUILDING

Annexure IV (a) – Smart Bus Stop Site Topography



Annexure V – Environmental Clearances

(Schedule-A)

1. As per EIA notification 2006 and subsequent amendments, all necessary compliances shall be responsibility of MSI.

Appendix A1 – Index Maps and Location Maps

(Schedule-A)

MUNICIPAL CORPORATION, TIRUPATI

POINT A	13°38'10.0"N 79°25'20.4"E
POINT B	13°38'08.4"N 79°25'23.6"E
POINT C	13.636937, 79.423971
POINT D	13.637041, 79.422978

Schedule B - Scope of Works

(See Clause 20.1)

1. Development of the Project COC Building

Development of the City Operations Centre (COC) building shall include design and construction of the following as described in this Schedule-B and in Schedule-C.

General

MSI shall be responsible for making the facility fit for the intended purpose while performing all of its obligations covered under the Contract Document in its entirety. The work shall be done in accordance to the drawings approved by the statutory authorities.

Scope includes Site / Campus Planning, Demolition of existing structures, developing required specifications, preparing Good for Construction (GFC),coordinated drawings and construct entire campus in accordance with the same. The scope shall also include preparation of as-built drawings before handing over the work to the Client, maintaining the Quality assurance & Quality control (QA&QC) including control, corrective actions, reporting and arranging for regular inspections by all concerned.

MSI has to obtain GRIHA 5 Star rating. The buildings are to be designed as per NBCC, GO and GRIHA Guidelines.

As deemed necessary by the Employer/Employer's Engineer/PMC, MSI shall execute necessary physical model, mock-ups of all items/activities related to the Work performed required under this Contract as indicated below and the cost for the same shall be deemed to be included in the Contract price.

The MSI is advised to visit the site before submitting the Proposal for the works.

The Scope includes all temporary works required for the completion of works, testing and commissioning and handover till Defect liability Period.

The Scope includes all consumables required for the completion of works, testing and commissioning and handover till Defect liability Period.

- **Appendix B I:** Details of Population
- **Appendix B II:** Details of Built-up area
- **Appendix B III:** Scope of Architectural and Landscape Works
- **Appendix B IV:** Scope of Civil and Structural Works
- **Appendix B V:** Scope of Electrical Works
- **Appendix B VI:** Scope of HVAC Works
- **Appendix B VII:** Scope of Fire Fighting Works
- **Appendix B VIII:** Scope of Plumbing Works
- **Appendix B IX:** Details of Fire Detection Alarm System, Smart Card based access and CCTV surveillance
- **Appendix B X:** Details for GRIHA rating
- **Appendix B XI:** Scope of Road Works
- **Appendix B XII:** Scope of Storm Water Drainage network
- **Appendix B XIII:** Scope of Sewage Treatment Plant (STP)
- **Appendix B XIV:** Scope of Solid Waste Management Works
- **Appendix B XV:** Scope of IBMS / BAS Works
- **Appendix B XVI :** Scope of Interior Works

Specifications and Standards:
The City Operations Centre shall be designed and constructed in conformity with the Specifications and Standards given in Schedule-D.

2. Development Smart Bus Stops

- Construction of Smart Bus Stops with specified material and structural framework including seating areas, Kiosks/ATM, universal accessibility, provision for Public Information systems etc as per the design provided.
- Key Components of the Smart Bus stops include:

- The scope of works includes construction of 37 smart bus stops with 37 kiosks/ATM facility.
- Construction of smart bus stops shall be carried out in alignment with other ongoing projects in Tirupati smart city.
- Designing of the smart bus stop or kiosks/ATM facility is not in scope of the bidder. The design and tender drawings package for smart bus stops shall be provided by the client along or before the response to the queries raised by the bidders.

Appendix B I – Occupancy Details

(Schedule-B)

The COC building shall have the following indicative usage areas and respective indicative occupancy requirements are tabled below:

1. Entrance Foyers,
2. Parking
3. Building Services
4. Corridors,
5. Circulation cores,
6. Birth and death section,
7. Revenue section
8. Sanitary section
9. Conference (20 pax) at every section,
10. Dining area of every section.
11. Political floor and accounts section
12. Engineering section and planning section
13. Command control center
14. Commissioner's office and establishment cell
15. Helipad
16. Terrace Coffee Shops
17. Exquisite Landscape
18. Exterior development
19. Adequate Lifts, service elevator.
20. Façade
21. Elegant Office Interiors
22. Any other usage area envisaged by Designer as required for the fulfilment of proposed building infrastructure.

Table: 1: Proposed Building usage and Occupancy Details

Occupancy Details		
S.NO	**SPACE**	**No of Occupants**
1	Lobby and Reception	3
2	Birth and Death Section	44
3	Revenue Section	88
4	Sanitary Section	60
5	Mayor’s / Dy Mayor	2 (visitor seating 30 pax)

6	Conference	80
7	Allied activities	200
8	ACCOUNTS SECTION	31
9	Engineering Section	110
10	Planning Section	55
11	Command and Control Centre	50
12	Commissioner Chamber	190
13	Establishment Section	40
14	Additional chamber similar to Commissioner/MD, TSCCL Chamber	190
15	Helipad	On terrace
20 PERCENT EXCESS STAFF TO BE CONSIDERED IN THE DESIGN FOR FUTURE		

Appendix B II – Built-up Area Details

(Schedule-B)

1. COC Building- 1,30,000 Sq. Ft. , however bidders are strongly advised to do site visit to understand the requirements and design the usage for built up areas as required.

Appendix B III – Architecture and Landscaping Works

(Schedule-B)

1. Scope

The scope includes design, detailing, procurement, supply, construction, furnishing, testing and execution for "COC" [City Operations Centre in Tirupati] block and ancillary structures.

2. Look and Feel of the Project

The MSI shall study, specifications, material finishes indicated in the contract document and understand all parameters of the design including the architectural intent of the design. All Finishes as per the Table No 3 below, however bidders are expected to choose better finishing materials and design the COC building.

Table No.3

Entrance foyer, Circulation cores and Stilt parking			
S.NO	**SPACE**	**SPACE DESCRIPTION**	**INTERIOR COMPONENTS**
1.	LOBBY WITH PRIRMARY CORE	Main entrance Foyer with staircase/grand staircase and three elevators.	Visitors waiting furniture, reception table and wall cladding, wall paneling options and any other architectural elements
2.	SECONDARY CORE AND LOBBY	staircase with service rooms	Service rooms provision for electrical, fire, hvac etc., to be provided as per the standards and requirements.
3.	THIRD CORE	staircase	Exit staircase with opening into the outdoor for tackling emergency situations.
4.	PARKING	collonoid space for two wheeler and four wheeler parking	parking spaces for office staff, 2 wheeler, 4 wheeler and floor marking and directional mapping as per the design to be provided
	BIRTH AND DEATH SECTION		

5.	SUPERINTENDENT, SR AND JR ASSISTANTS	Senior and junior clerks open workspaces and public response counter's	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision for public interaction for 3-4 clerks, supervisors tables with pedestal and file storage with partitions.
6.	RECORD ROOM	storage spaces for birth and death record	File racks for old and new record storage, rack sizes to be designed as per the files dimensional standards.
7.	WAITING LOBBY	waiting lobbies in front of the counters	Seating for visitors waiting near the public interaction counters
8.	MEETING SPACE	Conference meeting space for birth and death section	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent
9.	DINING SPACE AND PANTRY AND STAFF TOILET	Dining space and rest rooms for birth and death section staff	Dining table for staff dining, panty counter to be provided with sink and Toilet provision for male/female.
10.	BREAKOUT SPACE	Open seating space's	Open terrace with outdoor seating and any other architectural features
	REVENUE SECTION		
11.	DEPUTY COMMISSIONER	cabin seating	Executive office table chair, storage rack, workstation for assistant, chairs and sofas for visitors wooden wall paneling as per the standards.
12.	PANTRY ROOM	Rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.

13.	TOILET	rest room	Toilet with all standard and premium fixtures
14.	REVENUE OFFICER'S	space for revenue officer's and Revenue inspectors	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision, supervisor’s tables with pedestal and file storage with partitions.
15.	BILL COLLECTOR'S	space for bill collectors	Work station, chairs with pedestals
16.	REVENUE SECTION	superintendents, computer operators and public response counters	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision for public interaction for 10 clerks, supervisor’s tables with pedestal and file storage with partitions.
17.	WAITING LOBBY	waiting lobbies in front of the counters	Seating for visitors waiting near the public interaction counters
18.	MEETING SPACE	Conference meeting space for revenue section	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent as per the standard
19.	DINING SPACE, PANTRY AND STAFF TOILET	Dining space and rest rooms for revenue section staff	Dining table for staff dining, panty counter to be provided with sink and Toilet provision for male/female.
20.	BREAKOUT SPACE	Open seating space's	Open terrace with outdoor seating and any other architectural features
	SANITARY SECTION		

21.	MHO'S	MHO'S cabins	executive office tables chairs with storage units, glass partition and wall cladding
22.	PANTRY ROOM	Rest space for MHO's	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
23.	TOILET	rest room for MHO's	Toilet with all standard and premium fixtures
24.	SR AND JR ASSISTANTS	Senior and junior clerks open workspaces and public response counter's	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision for public interaction for 3-4 clerks, supervisor’s tables with pedestal and file storage with partitions.
25.	WAITING LOBBY	waiting lobbies in front of the counters	Seating for visitors waiting near the public interaction counters
26.	SUPERINTENDENT AND SANITARY INSPECTORS	Sanitary superintendent and sanitary inspectors work space	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision, supervisor’s tables with pedestal and file storage with partitions.
27.	MEETING SPACE	Conference meeting space for sanitary section	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent
28.	DINING SPACE, PANTRY AND STAFF TOILET	Dining space and rest rooms for sanitary section staff	Dining table for staff dining, pantry counter to be provided with sink and Toilet provision for male/female.
29.	BREAKOUT SPACE	Open seating space's	Open terrace with outdoor seating and any other architectural features
Political floor and accounts section			

S.NO	SPACE	DESCRIPTION	INTERIOR COMPONENTS
30.	MAYOR'S CHAMBER	Mayor chamber with 30 seating capacity	Executive office table chair, storage rack, chairs and sofas for visitors wooden wall paneling.
31.	PANTRY ROOM	Rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
32.	TOILET	rest room	Toilet with all standard and premium fixtures as per the standard
33.	DEPUTY MAYOR CHAMBER	chamber with 20 seating capacity	Executive office table chair, storage rack, chairs and sofas for visitors wooden wall paneling
34.	PANTRY ROOM	rest space	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
35.	TOILET	rest room	Toilet with all standard and premium fixtures
36.	FLOOR LEADER CABINS	individual cabins for floor leaders with attached toilets	executive office tables chairs with storage units, glass partition and wall cladding
37.	CORPORATOR MEETING ROOM	meeting room of capacity 50 seating	conference meeting tables and chairs, storage, filing cabinets, as per requirement, Provisions for other suitable electronic systems, etc. to be considered
38.	STANDING COMMITTEE	Round table conference room of capacity 40 members	U shape conference table and provision for projector acoustics and wooden flooring or equivalent. Provisions for other suitable electronic systems, etc. to be considered
39.	MINI CONFERENCE	meeting hall of capacity 80 seating	Provision for stage (host seating), chairs for visitors (listeners) and projector, acoustics to be provided. Provisions for other suitable electronic systems, etc. to be considered

40.	SECRETARY ROOM	secretary cabin with work station provision for assistants	Open office space with workstations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision, supervisor's tables with pedestal and file storage with partitions.
41.	COUNCIL HALL	conference hall of seating capacity 100	Double height space with 2 level seating and balcony for media, visitors, Tables chairs for corporators (100), mayor to be provided wooden flooring and wall acoustics, sound system and other features as per the design. Provisions for other suitable electronic systems, etc. to be considered
42.	DINING HALL	Dining hall space for large events and pantry	Dining tables and pantry counter to be provided with sink and provision for wash area.
	ACCOUNTS SECTION		
43.	ACCOUNTS SECTION	open seating work station	Open office space with work stations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision, supervisors tables with pedestal and file storage with partitions glass cubicle and executive office table chair to be provided for the accountant
44.	ASST EXAMINER's	cabin seating	executive office tables chairs with storage units, glass partition and wall cladding
45.	EXAMINER	cabin seating with attached toilet	executive office tables chairs with storage units, wall cladding
46.	BREAKOUT SPACES	open seating space	Open terrace with outdoor seating and any other architectural features

47.	DINING SPACE, PANTRY AND REST ROOMS	dining hall and rest rooms for account section staff	Dining table for staff dining, pantry counter to be provided with sink and Toilet provision for male/female.
	ENGINEERING SECTION		
48.	SUPERINTENDING ENGINEER	Chamber	Executive office table chair, storage rack, workstation for assistant, chairs and sofas for visitors wooden wall paneling as per the design.
49.	PANTRY ROOM	Rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
50.	TOILET	rest room	Toilet with all standard and premium fixtures
51.	EXECUTIVE ENGINEERS 1	cabin with attached toilet	executive office table chair, storage rack, work station for assistant, chairs for visitors wooden wall paneling
52.	EXECUTIVE ENGINEERS 2	cabin with attached toilet	executive office table chair, storage rack, work station for assistant, chairs for visitors wooden wall paneling
53.	EXECUTIVE ENGINEERS 3	cabin with attached toilet	executive office table chair, storage rack, work station for assistant, chairs for visitors wooden wall paneling
54.	DEPUTY ENGINEERS	open work station seating with common toilet	executive office tables chairs with storage units, glass partition and wall cladding
55.	ASSISTANT ENGINEERS	open work station seating	Open office space with work stations, chairs pedestals and file storage units with partitions.

56.	DRAWING BRANCH	open work station seating	Open office space with work stations, chairs pedestals and file storage units for upper and lower divisional clerks, supervisors tables with pedestal and file storage with partitions.
57.	SR AND JR ASSISTANTS	open work station seating	Open office space with work stations, chairs pedestals and file storage units for upper and lower divisional clerks, supervisors tables with pedestal and file storage with partitions.
58.	COMPUTER SECTION	open work station seating	Open office space with work stations, chairs pedestals and file storage units with partitions.
59.	MEETING ROOM	meeting hall of capacity 50	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent
60.	DINING SPACE, PANTRY AND REST ROOM	Dining space and rest rooms for engineering section staff	Dining table for staff dining, panty counter to be provided with sink and Toilet provision for male/female.
61.	BREAKOUT SPACE	open seating space	Open terrace with outdoor seating and any other architectural features
	PLANNING SECTION		
62.	CITY PLANNER	Chamber seating	executive office table chair, storage rack, work station for assistant, chairs and sofas for visitors wooden wall paneling
63.	PANTRY ROOM	Rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
64.	TOILET	rest room	Toilet with all standard and premium fixtures
65.	DCP	dcp's cabins with attached toilet	executive office tables chairs with storage units, glass partition and wall cladding

66.	ACP	acp's cabins with attached toilet	Open office space with work stations, chairs pedestals and file storage units with partitions.
67.	CLERICAL STAFF	sr and jr assistants open work station space	Open office space with work stations, chairs pedestals and file storage units for upper and lower divisional clerks, supervisors tables with pedestal and file storage with partitions.
68.	COMPUTER SECTION	computer operators room	Open office space with work stations, chairs pedestals and file storage units with partitions.
69.	RECORD ROOM	planning section record storage	File racks for old and new record storage, rack sizes to be designed as per the files dimensional standards.
70.	MEETING ROOM	meeting hall of capacity 50	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent
71.	COUNCIL HALL BALCONY	COUNCIL HALL BALCONY AND DOUBLE HEIGHT SPACE	council hall balcony with visitor seating chairs and spaces for media (BALCONY ONLY 25% of area)
72.	DINING SPACE, PANTRY AND REST ROOM	Dining space and rest rooms for planning section staff	Dining table for staff dining, panty counter to be provided with sink and Toilet provision for male/female.
73.	BREAKOUT SPACE	open seating space	Open terrace with outdoor seating and any other architectural features
Command control center			
S.NO	**SPACE**	**DESCRIPTION**	**INTERIOR COMPONENTS**
	COMMAND CONTROL CENTRE (Pl refer ICCC section in Volume 2 (a) for Interior Specifications)		
74.	RECEPTION		visitors waiting furniture, reception table and wall cladding, wall paneling options and any other architectural elements

75.	COMMAND CENTER HALL	double height space with balcony viewing video wall	Double height space with 2 level seating and balcony for media, visitors,
76.	OPERATIONS MANAGER CABIN	manager cabin space with 10 seating	executive office tables chairs with storage units, glass partition and wall cladding
77.	MEETING ROOM 1	conference room 8 seating	Mini conference table with chairs, provision for sound system, projector. Glass partitions.
78.	MEETING ROOM 2	conference room 8 seating	Mini conference table with chairs, provision for sound system, projector. Glass partitions.
79.	MEETING ROOM 3	conference room 8 seating	Mini conference table with chairs, provision for sound system, projector. Glass portions.
80.	DATA CENTER	Raised floor data center and server space	Data center with racks for server storage and false flooring, false ceiling to be provided for conduit running.
81.	CONFERENCE ROOM	Conference room of 20 seating cap.	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent as per the design
82.	SITUATION ROOM	Meeting space	Conference room table with seating.
83.	OFFICER'S CABIN	Glass cabins for 2 officer's	executive office tables chairs with storage units, glass partition and wall cladding as per the design
84.	EXECUTIVE OFFICERS	Glass cabins for 3 officer's	executive office tables chairs with storage units, glass partition and wall cladding as per the design
85.	OFFICE SPACE	work stations for staff	Open office space with work stations, chairs pedestals and file storage units.

86.	TOILET SPACES	common toilets	Modular cubicle toilets with louvers and exhaust fans for light and ventilation
87.	CAFETERIA AND BREAKOUT SPACES	café lounge and dining seating space	Open terrace with cafeteria and outdoor seating and any other architectural features as per the design
S.NO	**SPACE**	**DESCRIPTION**	**INTERIOR COMPONENTS**
	COMMISSIONER OFFICE		
88.	COMMISSIONER/ MD, TSCCL CHAMBER	chamber hall	Executive office table chair, storage rack, work station for assistant, chairs and sofas for visitors wooden wall paneling as per the design.
89.	PANTRY ROOM	rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
90.	TOILET	rest room	Toilet with all standard and premium fixtures
91.	PESHI	cc to commissioner	work desk, chair and storage with visitor seating provision
92.	WAITING LOBBY	waiting lobby for general public	Seating for Public waiting
93.	VIP WAITING LOBBY	VIP waiting room	chairs, sofa with tea table provision for VIP visitor's
94.	CONFENCE ROOM	Round table conference space for 20 people	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent as per the design (should have direct access from commissioner's chamber)
95.	CONFERENCE HALL	large conference hall of 120 people capacity	Linear chair, table desk setup with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent as per the design
96.	BREAKOUT SPACE	Open seating spaces	Open terrace with outdoor seating and any other architectural features as per the design

97.	ADDITIONAL COMMISSIONER	cabin seating of 20 capacity	executive office table chair, storage rack, work station for assistant, chairs and sofa's for visitors wooden wall paneling
98.	PANTRY ROOM	rest space and pantry	Provision for cot, sofa, refrigerator side table storage and counter for pantry.
99.	TOILET	rest room	Toilet with all standard and premium fixtures
	ESTABLISHMENT SECTION		
100.	MANAGER, SR AND JR ASSISTANTS	Sr and Jr assistants open work station space	Open office space with work stations, chairs pedestals and file storage units for upper and lower divisional clerks with window counter provision, supervisors tables with pedestal and file storage with partitions glass cubicle and executive office table chair to be provided for the manager.
101.	COMPUTER SECTION	computer operator's room	Open office space with work stations, chairs pedestals and file storage units with partitions.
102.	MEETING ROOM	meeting hall of 50 capacity	Conference room table, chairs with capacity as per the space dimension, provision for sound system and projector, wooden flooring or equivalent
103.	COMMAND CONTROL ROOM	DOUBLE HEIGHT SPACE WITH BALCONY	Balcony space for command control viewing with conference table seating for video wall monitoring. (should have separate access for commissioner's frequent visit's)
104.	DINING SPACE AND PANTRY	Dining space for establishment section staff	Dining table for staff dining, panty counter to be provided with sink and Toilet provision for Male/female.
105.	BREAKOUT SPACE	Open seating spaces	Open terrace with outdoor seating and any other architectural features as per the design

3. Approvals of Design / Drawings

The MSI shall seek approvals from MD, TSCCL and PMC for every design stage. The MSI should not start any construction activities without prior approval on designs by MD, TSCCL.

4. Construction Documents / Documents

The MSI shall provide multiple options of the design of necessary element of the Work for the Employer's Engineer to review along with Client.

5. Documents at Site

The MSI shall maintain in a conspicuous place on the site a copy of development permission and a copy of approved drawings and specifications.

6. Landscape Works

a. **Scope**

The Landscape scope includes design, detailing, procure, supply, construction, installation, furnishing, equipping, testing, commissioning and execution of landscaping works [softscape], irrigation and fountains for entire "COC" building complex including mock-up for Landscaping items in accordance with the Drawings in Appendix B XVI,

- Site grading as per the requirements
- Good garden earth & manure
- Trees, shrubs, ground covers, lawns
- Drip irrigation system for trees and shrubs.
- Sprinkler system for lawns
- Tree Plantation
- The MSI will supply and install barricades for safeguarding landscape development area and works. He may also install the barricades in the landscape development area according to his own understanding if he feels that any part of the landscape area is bound to be damaged for any reason, MSI shall follow pre construction and during construction soil erosion control measures as per the NBC.

Appendix B IV – Civil and Structural Works

(Schedule-B)

1. Scope

The MSI shall carry out, and be responsible for the design of the Works, of COC building complex that includes, ancillary structures, compound wall, , security cabins, pavements, hardscape, drains, etc. The Scope of Work includes but is not limited to the following in relation to the design, construction, of the Works:

- Prepare Design Basis Report based on the design intent and submit for approval.
- Carry out Structural Design based on approved Civil Structural Design Criteria.
- Submit Structural stability certificate for all structures and components from government authority at his own cost.
- Proof checking by accredited agencies at bidders cost before submitting for the approval of the Client.
- Setting out the works: Site Topographic Survey and Geotechnical Investigations as deemed necessary by the MSI. Site Clearing, Site Grading, and Excavation including excavation for sump pits / lift pits.
- Piling, foundation & substructure works.
- Implement Anti termite treatment / Water proofing / Insulation works.
- Superstructure RCC works.
- Masonry.
- Plastering/Painting/Façade/External Finishes.
- Structural Steel work.
- Ancillary PCC / RCC works including equipment foundations / pedestals, etc.
- External Site Works including Landscape
- Signage
- Any other structures/Facilities as noted elsewhere in this document.

Appendix B V – Electrical Works

(Schedule-B)

1. Scope

The scope of work shall cover the design, engineering, manufacture, assembly, testing at manufacturer's works/ test labs, supply, delivery, properly packed for transport to site, unloading, storing at site of all equipment, erection and commissioning, test at site, performance guarantee test run, training of Client's personnel and handing over of the complete electrical system along with mandatory spares as per the terms & conditions. The scope of work shall comprise of, but not limited to the following:

- Power Supply system from nearest CSS to RMU.
- Independent stand-alone system for fourth and fifth floor of COC building assuring 100% backup in case of power failure. Power requirement for the development.
- High Side and Low Side equipment requirements such as Transformers and Switchgear.
- Non-segregated phase Busduct and sandwich Busduct with all associated accessories.
- Main Power Control Centers (PCC), Sub-Power Control Centers (Sub-PCC) and Motor Control Centers (MCC).
- Power Distribution boards.
- Automatic Power Factor Correction Panel with capacitors.
- Metering system.
- All HT/LT Power, control cables.
- Cable carrier system with necessary cabling accessories such as cable glands, lugs, termination and jointing kits etc.
- Fire proof sealing system comprising of fire stops and fire breaks.
- Lighting system including Fittings and fixtures.
- Common area lighting, Office space lighting and outdoor Lighting system comprising of lighting distribution boards, lighting transformers, light fittings, lighting poles, Power socket, associate lighting switches/sockets, associated cable, conduit and wiring.
- 100% DG Backup System with Diesel Storage Capacity.
- DG synchronizing panel.
- 110V DC systems complete with one battery set, 2 x 100% BC (Float cum boost chargers), DCDB.
- Vertical Transportation system with a waiting time of 35-40 sec and Passenger Lifts with a minimum speed of 1.75 m/s
- Electrical SCADA system.
- Earthing system comprising of Earthing Electrodes, Earthing strips/ conductors and associated accessories.
- Lightning Protection system as per early streamer emission method.
- Solar PV system for COC building.
- Miscellaneous items such as Local control push buttons, Welding Receptacles
- Safety Equipment's such as rubber mats, sign boards
- All related civil works required for completion, commissioning but not limited to trenches, foundations etc.
- Maintenance requirements as per Schedule E.

2. System Design Requirements

The following design criteria shall be considered by the MSI for the equipment and services supplied under this contract:

- Safety to personnel and equipment during the operation and maintenance.
- Reliability of service.
- Minimum fire risk.

- Ease of maintenance and convenience of operation.
- Automatic protection of all electrical equipment through selective relaying system.
- Electrical supply to equipment within the design operation limits.
- Adequate provision for future extension and modifications.
- Fail safe features.
- Suitability for applicable environmental factors.
- Maximum interchangeability of equipment.
- The design and equipment shall ensure satisfactory operation under variations of voltage ±10%, frequency (+) 5% to (-) 5%, combined voltage and frequency 10% for A.C., -15% to +10% for DC as may be met under operating conditions, including those due to starting loads and short circuit and other fault conditions.
- The MSI shall calculate the total power requirements for the development by summing up the power requirement for each floor in according to the design requirements.
- The power allocation of 138 VA/sqm (13VA/sft for) load shall be provided for the office areas including the common utilities such as plumbing, HVAC, firefighting, elevators, etc. This shall cater for the lighting, power and other systems installed.
- The MSI shall submit load calculation with the tender for the development taking into account the acceptable diversity factors and providing a margin of (10%) contingencies for the total power for the peak hour loads. The internal electrical power shall be tapped from the riser / electrical room located on each floor.
- System grounding.
- 11 kV: Unearthed system.
- 415 V: Solidly earthed.
- Fault level (For all equipment).
- 11kV: 31.5 kA for 1 Sec.
- 415V: 50 kA for 1 Sec.
- 230V: 12kA for 1 Sec.
- 110V DC: 10kA for 1Sec.

3. Specific requirements for Electrical Equipment's

The following are the additional design requirements shall be considered.

HT and RMU Panel

- RMU panel shall be metal clad, self-standing dust proof construction, outdoor cubicle type fitted with incoming load break isolators and outgoing feeders as vacuum circuit breakers with aluminium bus bar, fully draw out type. Degree of protection of RMU panel shall be IP65 or better.
- Required margin of (20%) shall be considered while sizing the bus bars and breakers for switchgear
- The relays in the 11kV RMU and 11kV HT panel shall be numerical type with IEC 61850 compatibility.

Dry Type Transformer

- Two no's of 11/0.433kV, adequately sized dry type, two winding, 50 Hz, natural air cooled with ON LOAD tap changer. The tap changer will be provided with +5% to -15% taps in steps of +1.25% on HV side.
- The transformer shall be 2 x 100% configuration i.e. it shall be sized such a way that if one transformer fails other transformer capable to cater full load.
- Transformer shall be designed such that the maximum efficiency shall be at 50% of its loading.
- 11/0.433 kV, Transformer LT side shall be suitable for terminating the 415V non-segregated phase Busduct and HT side shall be suitable for cable terminations.

Busduct and Rising Main

- Non-segregated phase Busduct shall be TPN, Bus bar material shall be of high conductivity electrolytic Aluminium conductor. Bus duct shall have degree of protection better than or equal to IP-54.

- 415V rising main bus bar shall be of sandwich construction and made up of high conductivity electrolytic aluminium conductor, non-ventilated design and the degree of enclosure protection shall be IP 52.
- Each Rising Main shall be equipped with an end feed unit / MCCB panel, at both ends.

Main LT Panel and Sub-Distribution panels

- Main LT panel shall be located at Ground floor
- Main LT panels shall be metal clad, self-standing dust proof construction, fully draw out type and IP 54.
- For feeders rated more than 400A, ACB with Numerical protection/built in microprocessor release, discrete multi-function meters or metering as part of ACB shall be provided. For all other rating feeders Microprocessor, based MCCB shall be used. All ACB feeders shall be compatible for remote control, metering and monitoring.
- Incomer and busbar shall be rated for full load current of the total load connected plus a margin of 20%, rounded off to the next standard rating. All outgoing feeder modules from each PCC shall be rated for the full load current plus 10% margin, rounded off to the next standard rating. All PCC shall be provided with 20% spare feeders.
- Incoming feeders shall be provided with ACB breaker with Numerical protection relay compatible with IEC 61850.
- For remote metering in SCADA for current, line voltage, bus voltage, kW, KWH either separate transducers or soft data shall be taken through communication of Numerical relays/MFM's looped and interfaced to SCADA. Architecture shall be submitted for approval.

Control Philosophy

- A highly reliable, microprocessor-based Electrical SCADA system complying with International automation standard IEC – 61850 shall be provided for the COC building and MCT Building Electrical system Control, metering and monitoring. All HT and LT switchgear shall be controlled from SCADA.
- Each switchgear whose incomes, buscoupler and outgoing breaker feeder are controlled from SCADA shall be provided with two IEC-61850 compliant managed ethernet switches. The IEC-61850 compliant numerical relays shall in turn be connected to both these switches either to form a ring or radially connected, so that loss of one connection does not result in loss of communication with any device. These switches shall be provided with fibre optic (FO) ports for interconnection with other switchgear switches, which form part of the IEC-61850 LAN network. Further interconnection to the SCADA shall be through redundant server.

APFC Panel

- Automatic Power Factor Correction (APFC) capacitor panels with capacitor bank of adequate kVAR rating to maintain the power factor of 0.98 lag at main LT panels.
- All Poly Propylene (APP) type Capacitor banks shall be housed in APFC Panel cabinet.

Motors

- Motors shall be energy efficient (IE2) squirrel cage induction type, TEFC, IP-55 enclosure (including terminal boxes and bearing housing) with Class-F insulation (and temperature rise limited to Class B).
- Lockable Stop Push Button (press to stop and key to release) shall be provided near to the each equipment. The enclosure shall be engineering plastic (scratch resistant), weather proof, corrosion resistant, dust and vermin-proof, suitable for mounting on wall or structures. The enclosure shall have degree of protection not less than IP55.

DC System

- The DC system shall be designed to cater the loads for control, protection and indication of 11kV switchgear, 415V breaker controlled feeder, control panel, DG AMF panel, RTCC panel shall be designed for 110V DC battery with 2 hours back-up time.
- 110V, 2 x 100%, float cum boost charger with a common 100% tubular lead acid / or better battery shall be provided which shall be located at ground floor level.

DG Set

- Emergency DG set shall be designed for complete 100% Building load redundancy. The Prime rated DG set shall be an Indoor type open construction mounted on base frame through anti vibration mounts. The cooling system for DG set is radiator type. The DG room shall be acoustically insulated along with panels to limit the noise in line with the norms as set by pollution control board.

Vertical Transportation (Elevators)

- COC shall be provided with passenger elevators.
- COC shall be provided with passenger elevators (separate for both COC and Municipal) of 18 passenger capacity, 1.75mps speed, MRL type and center opening door with automatic.
- SS doors & enclosures of elevators shall be fire rated for not less than 2 hours.

Solar PV System

- As per GRIHA requirement in order to achieve credit points under Energy & Atmosphere is the requirement of power from renewable source.
- Grid interactive solar PV system is proposed to cater this requirement. The system shall be with grid connected.
- Solar module shall be multi crystalline type, employing lamination technology using established polymer (EVA) and Tedlar / Polyester laminate.

Power, Control Cables and Cable carriers system

- The cables shall be 11000V un-earthed grade, single / multicore, stranded aluminium, XLPE insulated with PVC inner sheath, armoured and overall sheathed with specially formulated Fire Retardant Low Smoke (FRLS) PVC. Single core cables shall have aluminium wire / formed wire armour, whereas multicore cables shall have galvanised steel strip armour.
- LT power cables shall be 1100V grade, single / multicore, stranded aluminium conductor, XLPE insulated, with PVC inner sheath, armoured and outer sheath made of specially formulated FRLS PVC compound.
- The overall voltage drop shall be limited to 5% and the voltage dip shall be limited to 15%.
- The LT control cables shall be 1100V grade, multicore, 2.5 sq.mm cross section, stranded copper conductor having 7 strands, PVC insulated, inner PVC sheathed, galvanised steel wire/formed wire armoured and outer sheath made of FRLS PVC compound conforming to the performance requirements outlined above shall be used . The cables shall conform to IS:1554 (Part-I) - 1988 / IEC-502 (1983) in all other respects.
- Cable carrier system shall be designed for 70% loading.
- Power cables and control cables shall run in different shafts. Separate riser and trays shall be provided for the LV system.
- All cabling/wiring works shall be concealed wiring except for risers and in other areas where public or tenants do not have access or approved areas by the Client.

Lighting system

- LED Light fittings should be installed with effective reflectors. Mercury light fittings should not be used, instead Metal halide fittings shall be used.
- The luminaries shall be selected to suit architectural, functional and aesthetic requirements.

UPS system

- UPS are provided for critical system loads, servers and work stations, BMS, FACP (Fire Alarm Control Panel) & FARP (Fire Alarm Repeater panel), CCTV and Emergency lighting etc. with 3hrs battery back-up.
- The UPS will be 3ph to 3 ph, 50 Hz, Modular type, On-line, Redundant UPS power supply and with static bypass. The UPS output will be connected to the UPS DB for further distributions.
- During normal operation, the AC Supply will be fed to UPS Distribution boards through UPS and a small trickle charging current will be feeding to tubular lead acid battery for charging. Once the AC supply fails, for a momentary time till the DG picks up the battery will feed the UPS distribution loads through UPS.

Appendix B VI – HVAC Works

(Schedule-B)

1. Scope

The scope of works shall cover the design, engineering, Supply, Installation, Testing and commissioning of the complete Air-Conditioning (water / Air cooled chillers) and Ventilation (ACV) System of COC building. The scope includes all the related things like procurement, manufacture, testing at manufacturers' works, packaging, transportation, shipping, unloading at port, transportation to site, unloading, storage, insurance, transportation from stores to erection site etc.

2. System Design Requirements

3. Separate stand alone system for fourth and fifth floor of COC building

- Inside design temperature for all areas except server room should be: 24 +/- 1 ºC.
- Inside design temperature for server rooms should be: 22 +/- 1 ºC.
- Refer architectural specifications for occupancy details.
- N + 1 redundancy shall be provided for chillers, pumps, cooling towers etc.
- Double skin AHU shall be provided at all floor levels and treated fresh air units at terrace of each building.
- Air –conditioning will be designed and provided for all areas of COC buildings including main entrance lobbies, lift lobbies, IBMS, UPS & battery rooms, public grievances, stationery, counters, etc.
- Air conditioning shall also be provided to services plant room where deemed necessary by the MSI's designers to maintain the equipment's in optimum working condition.
- The air conditioning system shall preferably comprise central chilled water plant consisting of chillers, ideally suited for the nature of this project, pumps providing chilled water to air handling units, fan coil units complete with control panels, pipe works, valves, fittings, ductworks, grilles, dampers, etc. with necessary insulation / acoustic works.
- Cooling load requirements shall be based on heat load calculation to be submitted with the tender. The numbers of chillers and pumps shall be configured for duty and minimum one number on standby operation.
- Mechanical ventilation shall be provided to escape stairs, toilets, kitchens, services and equipment areas and any other areas to comply with the authorities' requirements. All M & E plant rooms shall be adequately ventilated to ensure maximum room temperature to be maintained not more than 30 ºC.
- Sufficient space shall be provided for maintenance and repair works in the plant room. Mechanical Ventilation System should be provided in plant room to ensure proper operating condition is achieved. All pumps, chillers and cooling towers should be provided with proper drain pipe system to the nearest floor traps. Proper cat ladders and safety guard rails should be provided for cooling towers. Floor should be waterproofed. Reliable auto-condenser tube cleaning system should be installed. Balancing valves & isolating valves (butterfly / gate / ball) flow valves should be installed in the chilled water and condenser water system. Appropriate vibration and acoustics measures should be implemented. Mono rails for future maintenance of the equipment's in the plant room are required.
- Vibration isolators for all ACV equipment.
- Complete framework required for mounting grills/louvers in masonry works is deemed to be included in ACV MSI scope.
- Painting of equipment, piping and supports of the ACV system as per National Building Code (NBC) or standards of the Client.
- Automatic controls and instruments including control cabling.
- Motor Control Centre and Cables.
- Wiring and earthling from MCC panels to various refrigeration, air conditioning and mechanical ventilation equipment, control wiring and interlocking.

- All the ACV system shall be provided with the connectivity to Building Management System (BMS) with a potential free contact. The MSI shall provide the minimum interface & connectivity of the ACV system to the BMS
- Provide larger size sleeve for crossing of pipe, conduits & cables through fire rated wall/partition. The sleeve shall be sealed with fibreglass and fire sealant.
- Fire/smoke dampers shall be installed to maintain integrity of fire compartmentation. The vendor shall submit installation details and obtain approval prior to execution at site.
- Balancing, testing and commissioning of the entire Air-Conditioning and mechanical ventilation system.

4. Associated Works

- The complete electrical work related to air conditioning services, shall be carried out by MSI.
- The scope includes the associated civil works like providing RCC/PCC foundations, pedestals for equipment like water chilling machines, AHUs, pumps & fans etc., and necessary plumbing works like providing floor and condensate drains in the equipment rooms.
- All associated Electrical Works are also in the scope of MSI. These shall be installed in accordance with approved shop drawings of, and under direct supervision.
- All associated Plumbing Works are also in the scope of MSI. Detailed specifications are mentioned in the electrical section. These shall be installed in accordance with approved shop drawings of, and under direct supervision.
    - Providing soft makeup water (Commercial hardness 0 ppm and pH 6.5 to 8.0) at cooling tower, and at chilled water expansion tank.
    - Providing sump pumps and necessary piping for drainage of air conditioning plant room and other machine rooms located below ground level.
    - Providing floor drains in cooling tower area and in air handling unit rooms.
    - Disposal of condensate drain from fan coil units / ceiling suspended units beyond the condensate drain riser.

Appendix B VII – Fire Fighting

(Schedule-B)

1. Scope

The Scope of works shall cover the design, engineering, Supply, Installation, Testing and commissioning of the complete Fire Fighting system including Fire alarm system of COC building. The scope includes all the related things like procurement, manufacture, testing at manufacturers' works, packaging, transportation, shipping, unloading at port, transportation to site, unloading, storage, insurance, transportation from stores to erection site etc.

2. System Design Requirements

- Main design components include Wet risers and the hydrant System including all pumps and pipe networks.
- Separate stand alone system for fourth and fifth floor of COC building
- Pumps shall be of three types, namely 2850 lpm & 88 m head electric, 2850 lpm & 88 m head diesel driven, and 180 lpm & 88 m head jockey pumps.
- All Accessories, but not limited to field instruments like pressure gauge & pressure switch and control cabling including junction box, erection hardware, etc., to MCC & diesel engine control panel should be included.
- Electrical panels, Cabling & earthling from MCC panels to various firefighting system, control wiring & interlocking.
- Instrumentation and Control equipment shall be complete with primary elements, initiating contacts for alarms, instrument impulse lines, fittings, power and control cables with suitable glands and terminations and instrument installation hardware.
- 4mm thick wrapping & coating for underground piping with proper testing.
- Sprinkler System for the complete development (within the scope of this contract).
- MSI shall carryout the hydraulic calculation using validated software.
- Fire extinguisher including mounting fixtures, anchor bolts, clamps, structures, etc. for all buildings in all the areas.
- Photo luminescent signage.
- Fire alarm system
- Firewater Storage at underground of COC building and Terrace level of building.
- Yard hydrant system around COC building.
- Two nos. Internal hydrant system in each level.

3. Associated Works

- The complete electrical work related to Firefighting including, but not limited to installation of pumps, shall be carried out by MSI.
- All associated Plumbing Works are also in the scope of MSI.
- The Scope includes the associated works like Structural works for pipe supports for above ground pipes, wall supports, hose cabinet supports, etc., Civil works like wall opening, chipping of foundation, grouting of foundations, sand filling and compacting for underground pipes, etc.
- Painting of equipment, piping, supports etc. with 2 coats of primer & 2 coats of synthetic enamel as per IS: 5 shade 536 (Fire Red).
- Supply of One set of special erection and maintenance tools and tackles.
- Start up and Essential spares.
- Recommended spares for 5 years operation.
- Anchor fasteners required for pipe supports of all the systems which are engineered by vendor and all anchor bolts, nuts, washers and inserts to be embedded in concrete for the equipment and piping.

- Shop inspection (in Vendor’s works & at project site after installation along with all required calibrated measuring instruments).

Appendix B VIII – Plumbing

(Schedule-B)

1. Scope

The Scope of works shall cover the design, engineering, Supply, Installation, Testing and Commissioning of the complete Plumbing system including Internal and External Water Supply, Internal and External drainage including Sewerage, Storm water drainage, and Rain water harvesting system of COC building. The scope includes all the related things like procurement, manufacture, testing at manufacturers' works, packaging, transportation, shipping, unloading at port, transportation to site, unloading, storage, insurance, transportation from stores to erection site etc.

2. System Design Requirements

- For Utility area at Ground floor additional features to include:
  - All the transfer pumps, connection between underground tanks and transfer pumps, related piping, valves and accessories etc.
  - Auto level sensors with required controls like solenoid valve for each tanks (both underground tanks and overhead tanks) for automatic operation of transfer pumps.
  - Transfer pumps (1w + 1s) for each potable water & non-potable water system Water supply pipes in Utility area
  - Separate piping from utility area to each overhead tank through trench with required supports.

- Complete distribution of potable and non-potable water distribution for proposed building.
- There are three piping outlet to be taken from each potable and non-potable OHT. Water supply for top three levels (3rd, 4th & 5th) shall be supplied through booster pumps with pressure sensors. Individual piping connections shall be taken for next levels (Ground, 1st & 2nd) respectively to maintain the uniform pressure.
- Works to include for air vents, PRV, water meters, valves, pressure gauges, water hammer arrestors, Nahni traps, Floor gratings, Gully trap, grease trap, man holes, inspection chambers, required piping connections etc.
- Required capacity booster pumps with pressure sensor system with required controls and instruments at terrace level for each drinking water system and flushing water system with standby for each building.
- Cabling & earthling from MCC panels to various plumbing/ sanitary system, control wiring & interlocking.
- Field instruments like pressure gauge & pressure switch and control cabling including junction box, erection hardware, etc., to MCC
- Instrumentation and Control equipment included in the package unit shall be complete with primary elements, initiating contacts for alarms, instrument impulse lines, fittings, power and control cables with suitable glands and terminations and instrument installation hardware.
- Supply & Installation of following complete Sanitary Fixtures and Fittings as per the model and make mentioned in the tender specifications.
  - Modular toilet cubical of 25mm thick waterproof boards with stainless steel hardware.
  - Provision for Wall hung EWC, counter top wash basins, press and close faucets, exhaust inbuilt windows.
  - Urinal with sensor system (Model: C05075 New Magnum & Jaguar Concealed urinal flush sensor 51087).
  - Pantry sink.
  - Shower assembly.
  - Cocks & taps.

- ABS Rinsing spray.
- Janitor sink.
- Hand drier, tower ring, soap dispenser, toilet paper holder, twin coat hook etc.
- Following Jaguar make sanitary fixtures shall be considered:
    - Florentine Bib cock angular FLR 5037NGE.
    - Florentine Bib cock straight FLR 5047NGE.
    - Florentine Pillar cock straight FLR 5011NGE.
    - Allied Health Faucet ALD 573GA.
    - Florentine Angular cock FLR 5053N.
    - Florentine Sink cock extended FLR 5347NGE.
    - Florentine Stop cock straight FLR 5083N.

3. Associated Works

- The complete electrical work related to Plumbing works including, but not limited to cabling and earthing of various fixtures and control wiring shall be carried out by MSI.
- The Scope includes the associated works like Structural works for pipe supports for above ground pipes, wall supports, hose cabinet supports, etc., Civil works like wall opening, chipping of foundation, grouting of foundations, sand filling and compacting for underground pipes, etc.,
- Painting of equipment, piping, supports etc. with 2 coats of primer & 2 coats of synthetic enamel as per relevant IS codes.
- Start up and Essential spares.
- Recommended spares for 5 years operation
- Anchor fasteners required for pipe supports of all the systems which are engineered by vendor and all anchor bolts, nuts, washers and inserts to be embedded in concrete for the equipment and piping.
- Supply of One set of special erection and maintenance tools and tackles.
- Cutting holes, chases & like through all types of walls /floors and finishing for all services crossings, including sealing, frame works, fire proofing, providing sleeve, cover plates, making good structure and finishes to an approved standard.

Appendix B IX – Fire Detection Alarm System, Smart Card Based Access and CCTV Surveillance

(Schedule-B)

1. Scope

The scope includes design, detailing, procurement, supply, installation, equipping, testing, commissioning and execution of ICT Solution consisting of Fire Detection & Alarm System and Public Address system, Smart Card based Access Control System, CCTV Video Surveillance System, Network Management System, Visitor Management System, BMS for common areas of COC Building in accordance with the RFP requirements.

2. System Design Requirements

For Fire Detection system and Public Address System

- The system shall comprise of heat and smoke detectors, manual call points, hooters and Public Address System.
- The system shall comprise of microprocessor based addressable fire detection system.
    - Integrated smoke and heat detectors.
    - Manual call points.
    - Hooter sounders with flashers.
    - Ceiling mounted speakers for PA system.

Smart Card based Access Control System

- The features in the design should include:
    - Contact less card based solution.
    - Visitors pass with company detail.
    - Separate Access controls for fourth and fifth floor.
    - Manually / Remotely operated access for vehicle movement.
    - Electrically operated door lock.
    - The location of access control locations should include all critical locations like the services areas, locations where visitors are not allowed, roof, lift machine areas.
    - RFID cum biometric readers for doors.
    - Electromagnetic door locks (600 lbs, Smart Cards (Mifare Desfire, 4KB) with dual side printing with colour in front & B&W on back. Plastic Card Holder with Lanyard).

CCTV Video Surveillance System

- The main objective is to monitor and record the activities, movement of people and vehicles through entry points inside the building, to monitor perimeter.
- Cameras to be positioned at all areas to enable a total secured building.
- Video Cameras should be - IP Mini Dome Colour IR, 2 MP, Varifocal lens

Network Management System

- The features in the design should include:
    - 12 Port Managed Network Edge / Access Switch, 10/100 Mbps with POE.
    - 8 Port Managed Network Edge / Access Switch, 10/100 Mbps.
    - 24 Port Managed Network Aggregation Switch, 10/100 Mbps.
    - Network Management Server / Workstation with software.

- Network Rack (42U).
- PVC Conduit pipe + installation.
- AT6 Cable + installation.

Visitor Management System

- The features in the design should include:
  - Work stations.
  - Smart Cards (Mifare Plus, 1KB) with dual side printing with B&W in front & B&W on back. Plastic Card Holder with Lanyard to be supplied.
  - Laser Printers (A4 Size printing).
  - Smart Card Printer (Dual side thermal-dye sublimation Card Printer with dual side lamination.

3. Associated Works

- All associated electrical / civil work related to above works including, but not limited to cabling, earthing and structural works for support / fixing of various fixtures, wall openings, grouting, foundations, sand filling and control wiring shall be carried out by MSI.

- The MSI will carry-out any interfacing / Integration of the systems as required between the systems and also with the BMS (Lift, AHU, Lighting, DG Set Panels)

- Required UPS Power will have to be made available by MSI. The power cabling & Ethernet / Optical Fibre cabling, Ethernet Switches and other network hardware shall be provided by the MSI.

Appendix B X – FIRE FIGHTING SYSTEM

(Schedule-B)

1. Scope

The scope of work includes complete design and engineering for the water tanks, pumps, fire hydrant system, hose reel system, sprinkler system, fire alarm and automatic detection system, two ways talk back system, first aid fire extinguishers and signage as per codes and standards listed below.

2. Design Requirements

Fire protection system shall be designed and install as per the following codes and standards

- NBC, 2016: National building code, part IV
- IS 2189:1999: Installation & maintenance of fire detection and alarm System
- 2002: Design and installation of fixed automatic sprinkler fire extinguishing system
- IS 13039:1991: Yard hydrant system
- IS 3844:1989: Internal hydrant system
- IS 1239 / IS 3589: Specification for MS Pipes
- IS 5290:1993: Specifications for hydrant landing valves
- IS 15683:2006: ABC powder type extinguishers
- IS 9457:1980: Safety colours and safety signs
- IS 12349:1988: Fire protection – safety sign and Local fire authority requirements

Appendix B XI – GRIHA

(Schedule-B)

1. Scope

The objective of the MSI is to help the Client meet all sustainability goals (including GRIHA) set for the project. The MSI shall also help the Client secure GRIHA-5 star rating for this project.

2. Design Requirements

- The MSI shall facilitate complete green-building certification process for the project.
- The MSI shall assess all available building data to understand and maintain current design goals and strategies for detail design and construction. All available building information shall be made available to the MSI for the same. In case the information is not available, the MSI shall make suitable assumptions and cross check with the Client.
- The project shall be registered with GRIHA for GRIHA evaluation and is aspiring for 5 star rating under GRIHA. To achieve 5 star certification the project has to follow certain best engineering practices and select materials that are compliant with the GRIHA rating system. Hence the following roles and responsibilities have been identified for the MSIs to ensure that the project achieves this target.
- In addition, the MSI will appoint a suitable MSI/consultant for the documentation and submission of documents to GRIHA for approval.

3. Associated Works

- The appointed consultant shall be responsible for the certification of the building as GRIHA 5 star certification of building.
- All associated works like collection of Information, assessment and documentation of information, final submission and weekly reporting to the Client on the progress is included.

Appendix B XII – Road Works

(Schedule-B)

1. Scope

The scope of proposed road works includes development of internal roads/driveways, pathways and parking areas within COC building site. The MSI shall carry out, and be responsible for, the design and execution of the roads works, including any site surveys, subsoil investigations, materials procurement and testing, and all other things necessary for proper planning, design and construction.

2. Design Requirements

- MSI shall undertake the Site Topographic Survey and Geotechnical Investigations as deemed necessary.
- MSI shall give proposed finished road levels (FRLs) / finished ground levels (FGLs) in due relation with accessibility to various buildings or developed areas and proper drainage of overall site including Site Grading.
- MSI shall do Structural Design of all retaining structures, culverts, etc. based on approved Civil Structural Design Criteria.
- For all structural designs and drawings the MSI must get the proof check done by accredited agencies at his own cost before submitting for the approval of the Client.
- MSI shall prepare and submit General Arrangement (GA) Drawings, Construction Drawings, Site Layouts, etc., necessary for execution.
- MSI shall coordinate with other design / implementing agencies related to building works, site infrastructure utility works, i.e. water, sewerage, electricity, telecommunication lines, etc. for road design and proper execution. All proposed underground utilities shall be executed first before road finishing works to avoid any reworks.
- The construction works shall include but not limited to Soil stabilization or other measures to be implemented to improve soil subgrade strength as per design intent.

Appendix B XIII – Storm Water Drainage Network

(Schedule-B)

1. Scope

- The Scope of Work for proposed storm water drainage system under this contract includes but is not limited to the following in relation to the design, supply, construction, testing and commissioning of storm water drainage system of the Works.
- Storm water collection and disposal system.
- Excavation, dewatering, ramming, refilling, and disposal of surplus excavated soil for pipe / box trench.
- Construction of all type inspection chambers.
- Supply, laying jointing, testing and commissioning of RCC NP-3 pipe/ precast RCC rectangular drains with all section sizes as indicated in the layout plan of storm water drainage system.
- Hydraulic Testing and commissioning of the entire work.
- It is stongly advised to study the run off and rainfall data along with storm water drainage system and design the building premise landscape accordingly to have absolute no water logging or flooding of the pathways.

Appendix B XIII – Sewage Treatment Plant (Package STP)

(Schedule-B)

1. Scope

Development of the City Operations Centre (COC) shall include design and construction of the following as described in this Schedule-B and in Schedule-C.

This bid is for the design, engineering, manufacture, supply, installation, testing and commissioning and operation of package STP system excluding the Civil Work execution in line with the details given in this document.

MSI to design the actual capacity based on the population in Appendix BI and as required for the project.

The scope of work includes all mechanical and bought-out equipment, piping, electrical and instrumentation work. The turnkey supplier shall provide all the drawings and details as required for the Consultant to carry out civil design and for a separate civil MSI engaged by the Client at site to carry out the civil work for the STP. Turnkey supplier has to consider visits to site at key stages for guiding the civil MSI, if required, to ascertain that work is carried out as per the drawing requirements.

2. Design Requirements

The Sewage Treatment Plant (STP) will be designed based on the various details mentioned in i.e. Basis of design. The sewage treatment plant will be suitable for semi-automatic operation, wherein starting/tripping/ of all the pumps will be controlled by level sensors provided in the tank. Pumps will start once water level reaches desired high level and will stop once water level in the tank lowers down to desired low level. Filter backwash operations will be semi-automatic. All other operations including chemical dosing and sludge draw off will be suitable for semiautomatic operation. Various details of sewage treatment plant will be as mentioned below.

Appendix B XIV – Solid Waste Management

(Schedule-B)

1. Scope

The scope of works is to ensure that the entire solid waste generated in the COC building is treated and managed. It includes collection and segregation of waste at source using colour coded bins under hygienic conditions and then treating it using organic waste composter including disposal of recyclable and inert.

2. Collection and Segregation of Solid Waste

- 100% collection of solid waste from all facilities.
- Segregation of waste at source.
- Separate wet and dry waste collection system.
- Collection at pre-informed time (two times a day) from all waste generation source.
- Provision of three colour coded bins (wet, dry and recyclables) for waste collection from common areas.

3. Treatment of Biodegradable waste using Organic Waste Composter

- Design, construction, supplying, erection, testing and commissioning of Organic Waste Composter (OWC).
- The design and capacity of the OWC shall be decided by the bidder based on requirements.
- Demolishing the existing structures, if any, on the site.
- Supply, erection testing & commissioning of the mechanical and Electrical & Instrumentation equipment
- Providing walkways and platforms of minimum 1.2 m width as access.

4. Disposal of Recyclables and Inert

- The recyclables like paper, plastic and metal to be stored in the utility area for a maximum duration of 15 days and then be sold to authorised vendors for handling recyclables.
- The inert to be stored in utility waste handling area and will be sent to the nearest authorised municipal solid waste landfill site.
- Any hazardous waste generated from the complex like used DG oil; old batteries etc. to be handed over to SPCB authorized hazardous waste handling vendors.

5. System Requirements

Design, construction, supply, erection, testing and commissioning of Composter with walkway and platform 1.2 m wide.

6. Associated Works

- Preparation of process, electrical and mechanical component design.
- Integration with other civil, mechanical, and electrical, integration with proposed architectural, construction of the main structure.
- Associated civil, electrical and other services works.
- Demolishing the existing structures, if any, on the site.
- Construction of civil engineering works for the platform.
- Supply of all spares required during performance run and during 36 months of O & M period.
- The recyclables like paper, plastic and metal to be stored in the utility area for a maximum duration of 15 days and then be sold to authorised vendors for handling recyclables.
- The inert to be stored in utility waste handling area and will be sent to the nearest authorised municipal solid waste landfill site.
- Any hazardous waste generated from the complex like used DG oil; old batteries etc. to be handed over to SPCB authorized hazardous waste handling vendors.

- The compost from the treatment of organic waste should be used for landscaping in the COC Complex.

Appendix B XV – Integrated Building Management System (IBMS)/ Building Automation System (BAS)

(Schedule-B)

1. **Introduction**

An Integrated Building Management System (IBMS) or a more recent terminology Building Automation System (BAS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as Plumbing, Heating, Ventilation, Lighting, Power System, Lifts/ Elevators, Fire Alarm & Detection Systems, including the security systems like; Public Address System, Access Control, CCTV Surveillance & Intrusion systems.

2. **Scope**

The System provider shall furnish and install a fully integrated Building Management System (BMS), incorporating distributed control techniques and standard open communication networks. The system shall be implemented as an integrated, open solution, which enables Service Center connectivity through standard Building Operating System (BOS) interface.

The integrated systems shall include controls and monitoring of the whole building (BMS and Security) and common areas wherever applicable.

Integrated Building Management System shall include the control and monitoring of the following subsystems:

- Building automation (cooling/heating control, ventilation control, pumps, etc.).
- Lighting control of common areas.
- Access control system for common areas.
- CCTV Video monitoring system for common areas.
- Fire Detection & Alarm system for common areas.
- Elevator Control.
- Pump Control.
- Back-up power / UPS Control.
- Water consumption metering.
- Electricity consumption metering.
- Cooling energy consumption metering.

3. System Requirements

The IBMS shall consist of software and hardware; the software program configured in a hierarchical manner that integrates the various subsystems.

System integration shall enable significantly lower energy consumption, real-time control and monitoring, and dynamic graphics according to needs. System integration shall create better environmental air quality, radically improved energy performance and increased water efficiency, according to requirements of GRIHA and other Green Building standard and initiatives.

System integration shall also allow for efficient system maintenance and full-scale service provisioning with radically lower cost and better quality services. Easy access to building systems shall ensure that everything is in perfect condition and functions in the optimal way at all times. Should anything disturbing happen, immediate response shall be available. Integration shall facilitate undisturbed conditions in the building and sustainable development through minimized energy consumption, first-class security and significantly lower life cycle costs.

4. System Architecture / Specifications

The system shall be implemented as an integrated, open solution, which enables Service Center connectivity through standard Building Operating System (BOS) interface.

The System Architecture shall consist of four levels:

- Service Level.
- Management Level.
- Control Level.
- Field Level.

The system shall be modular in structure and freely expandable at any stage. Each level of the system shall operate independently of the next level up as specified in the system architecture. For example, Control Level shall operate independently without support from Management Level. The system shall be fully consistent with the latest industry standards.

To enable efficient functional system integration and to provide maximum flexibility and to respond to changes in the building use, the system offered shall support the use of LonWorks, Modbus, M-bus, Ethernet TCP/IP and Internet communication technologies.

a. **Service Level** shall allow the systems to be connected without additional software to one or several Service Center(s), for providing centralized remote monitoring, alarm and fault detection of connected building management and security systems.
b. **Management Level** shall provide a uniform view to all systems through the open Building Operating System (BOS) platform. All the systems - controls of cooling, ventilation and lighting, consumption measurements, access controls, fire alarms and CCTV systems - shall be integrated with the BOS using device drivers.
c. **Control Level** shall consist of a distributed network of smart controllers, which communicate to each other subsystems using compatible interfaces. Connectivity towards Management Level shall utilize standard TCP/IP protocol.
d. **Field Level** shall consist of sensors and devices with industry standard interfaces.
   Systems shall be accessed through the Building Operating System (BOS). System must have two main user interface types – professional user interface and occupant user interface.
e. **Professional User Interface:**
   The system shall enable a client-based User Interface for professional usage and for central monitoring of systems (Service Center usage). The professional User Interface shall allow for at least the following:

   - Alarm monitoring and alarm handling by multiple operators.
   - Intruder alarms.
   - Fire alarms.
   - Alarms from electrical and mechanical systems.
   - System maintenance alarms.
   - Video monitoring.
   - Remote diagnostics, energy optimization and trending.
   - Set-point adjustment.
   - Control optimization.
   - Peak load management.
   - Trending.
   - Remote diagnostics of system/devices.
   - Preventive maintenance.
   - Consumption reports for energy management and billing.
   - Logs and reporting.
   - User profile and role management.
   - Access rights management.

The professional User Interface shall be implemented as a client application, which includes an automatically adapting tree structure of the building, building's parts, individual spaces, different systems and parts of systems. The tree structure can be used for navigation through the system.

All subsystems connected to Building Operating System can be accessed through the same graphical User Interface. The client software can be installed to unlimited number of remote computers or laptops. The client software shall allow for remote Internet usage of several sites using the same client.

The professional User Interface shall show system views, floor plan views, trend view, alarm view and event log view per building and system layer. Any alarm shall be shown in red color in both graphical views and tree structure. Each alarm message shall include shortcut to relevant graphical system and floor plan view.

f. **Occupant User Interface**

The browser-based occupant User Interface shall be generated automatically using the structure of the building defined in the Building Information Model. The browser-based User Interface shall utilize latest web technologies, such as AJAX. The user interfaces shall provide easy access to frequently needed functionality, such as lighting controls, temperature set point modifications, alarms, and configuration of scenes and modes of the space. The same user interface functionality shall be usable through any device with a browser.

The browser-based occupant User Interface shall allow for at least the following actions:

- Changing the mode of the space.
- Modifying the mode settings of the controlled devices.
- Changing the set-points.
- Modifying the control settings (e.g. dimming level).
- Manual controls.
- Door controls.
- Camera views.
- Alarm list browsing.

Appendix B XVI – Interior Works

1. Introduction

Proposed new COC building consists stilt + 5 upper floors and terrace (6 slabs).

- **Stilt floor:** Building cores, parking and service handling spaces and rest spaces for drivers.
- **Terrace floor:** HVAC chillers platform, OHT and Solar system, Helipad, Coffee Shop
- **External:** Underground sump, SUMP, Composite pits, seating lawns and other services.
- **Common:** staircase and lobbies, toilets and service spaces.

The structure for proposed office facility designed as per the above description.

1.1 Doors:

Hollow metal sheet door as per IS 1038 frame made out of 1.2 mm thick GI sheet with 100x57 box section, fitted with a shutter made out of 2 no's of 0.8 mm thick GI sheet of 46mm box section filled with Kraft paper honeycomb as infill epoxy powder coating. Or any other equivalent door system approved by the concerned government authorities.

1.2 Windows:

Un-Plasticized Poly Vinyl Chloride (UPVC) openable doors with openable shutters duly manufactured using UPVC reinforced profiles of 60 mm x 55 mm x 2.0 mm for outer frames, 70 mm x 60 mm x 2.25 mm for mullion sections as per the need and 102 mm x 60 mm x 2.0 mm for openable shutter frame capable of mounting single glazing system structurally reinforced with hot dip galvanized up to 50 microns of minimum thickness of 1.2 mm prefabricated & welded through fusion welding the window sash shall be fitted with 5 mm thick clear float glass of reputed make duly fixed with TPV Gaskets/ EPDM weathering seal resistant and accessories for openable door - hinges of stainless steel grade 304- 3 Nos., per shutter handle with Mazak alloy casting 1 No. per shutter, locking system suitably concealed 1 No., with raiser wedges for smooth operation and the system is to be installed at the site using anchor fasteners, silicon rubber sealant, easy glazing/ deglazing at site etc or equivalent.

Aluminum anodized casement windows - Aluminum Casement windows/doors in approved color powder coated/wood finished/anodized with minimum 60/70/15 microns thickness respectively made out of Hidalgo Extruded profiles, Special accessories & hardware, complete as per design, details and specification as given in the drawing, Sealing of joints with weather silicone sealant, all of approved make & complete as directed. Outer frame section no.7789 (49.4X41mm), Intermediate mullion section no 7812 (71.4 x 40.50 mm), Internal/External Shutter section 7811 (73X50 mm) with clip suitable for glass panel thickness up to 21mm.All corner joints are mitre cut joints assembled using die cast /extruded aluminum corner joints fixed with external buttons, alignment corner joints for rapid and secure joint assembly, no screwing of corner joints are allowed. All mullion and transom joints are with spring-loaded die cast Cross connector, Handle. Locking & Hinges, single point or multi point according to the weight of the shutter with glass to be provided. Make hindalco or equivalent.

1.3 Flooring:

For public circulation spaces vitrified non-skid full body tiles of premium quality, internal spaces with polished full body vitrified tiles of premium quality, Granite leather finish for staircase, wall cladding with marble/granite for reception and lift lobbies, engineered waterproof wooden flooring for meeting halls and chamber and false flooring for conduits running in command city centre. (approved and selected by concerned government authorities).

High Pressure Laminate:

The superior GLE technology weather proof laminates. The sheet Cladding Comprises of 6mm thick flat panel to backup frame work comprising of 75mm x 25mm x 1.5mm,50mm x 25mm x 1.5 mm powder coated to a required shade aluminum 'BOX' Pipe enclosed to the walls using bolts. All panels will be fixed with Colour Rivets to aluminum backup frame. The system will be open joint system and there will be 6mm to 8mm open spacing between each Panels.

1.4 Glazing:

Curtain wall systems are non-structural cladding systems for the external walls of buildings. They are generally associated with large, buildings. Curtain separate the interior from the exterior, but only support their own weight and the loads imposed on them (such as wind loads, seismic loads, and so on) which they transfer back to the primary structure of the building. This is in contrast to many forms of traditional construction in which the external walls are a fundamental part of the primary structure of the building.

Typically curtain wall systems comprise a lightweight aluminum frame onto which glazed or opaque infill panels can be fixed. These infill panels are often described as 'glazing' whether or not they are made of glass.

A glass mullion system is a type of glazing system that can be used to construct vertical glass curtain, canopies, skylights, and so on, allowing large areas of glazing to be created whilst maintaining a high level of transparency. It is formed by sheets of tempered glass held in position by clamps and joined to the glazing by a structural silicone sealant or by metal patch plates. The glass mullions are typically suspended from the head structure above and can span distances of more than 20 m or more, transferring wind, snow and self-weight loading back to the primary structure.

1.5 Ceiling

Horizontal level 600 mm x 600 mm 15/16 mm thick Arm strong false ceiling system manufactured by M/s Arm strong world Industries using hot dipped Galvanized Steel section exposed surface with pre-coated capping, main Tee of size 24 x 32 mm at every 1200 mm c/c maximum and rotary stitched cross tee of size 24 x 27 mm at every 600 mm c/c and sub-cross tee of size 24 mm x 25 mm at 1200 mm c/c and wall angle of size 19 x 19 mm fixed to periphery of the wall and the above grid is suspended at every 1200 mm c/c in both directions using 2.0 mm thick pre-straightened GI Wire laying fine fissured butt edge ceiling tiles of 15 mm thick mineral fibre Board manufactured by M/s Arm Strong World Industries Ltd., having RH 99% and for finished of size 600 x 600 mm or any other equivalent approved and selected by concerned government authorities

1.6 Toilets

Modular toilet cubical of 25mm thick waterproof boards with stainless steel hardware. Provision for Wall hung EWC, counter top wash basins, press and close faucets, exhaust inbuilt windows.

Plumbing fixture -

- **EWC** wall hung of approved standard make with p or s trap with dual flush with all internal parts of make jaquar or equivalent.
- **Counter top wash basin/counter sunk wash basin** to be fixed on granite counter with under storage of jaquar or equivalent make.
- **Plumbing piping fixtures** all fixtures of standard material of government approved make to be used as per the SSR AP specification.
- **Faucets, traps, pillar taps, and sanitary fixtures** standard approved make as per SSR AP.

2. Furniture (Executive Tables, Work Stations, Meeting Tables, Side Tables, Cots)

Manufacture of executive tables, work stations, meeting tables, side table, cots Using 18/36mm thickness plywood of BWP 710 (Wingor) or Equivalent make as per the design of the furniture, finished with 1 mm thick colour laminates Externally and Internally finish using Greenlam or equivalent make laminates. Using all S.S Hardware. (shades and hardware approved By Commissioner) Edge band make: Rehau, Hardware make : Hettich, Ebco OR Equivalent make furniture approved by concerned authorities.

2.1 CHAIRS

Revolving chair Manufacture of chair made of mesh & Fabrics material, seat with plastic inner board and outer shell, black plastic frame, gas lift height adjusts made by MDI, Chromed steel base, Twin wheel 65mm nylon caters, Height adjustment, forward & back ward & pivot for PU pads Armrest, Height adjustment, angle lock for back slide mechanism, Forward, backward & Height adjustment and chair hierarchy to be maintained as per the existing HR pattern. For visitors ss mesh sledge-based chairs with to be provided Make: Featherlight or Equivalent make approved by concerned authorities.

2.2 PARTITIONS

Wooden partitions made out of made of seccolor pre painted steel (base steel as per IS 513 of 0.58 mm thick 'D' quality, galvanized as per IS 277 with Zinc of 120 GSM). Primer coated with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick alkyd backer. Section for outer frame should be 46x52mm, section for shutter should be 46x46mm, section for mullion should be 46x70mm, section for beading should be 18x25mm and section for middle and bottom rail (Lock Rail and Kick Rail) of size should be 23x130mm. The partition should be sandwiched on both sides paneled with 9mm pre-laminated particle board/ laminated ply wood with writing board and pin board of height with respect to the design with 5mm thick plain glass With Ethyl Propylene Diamine Monomer (EPDM) Gaskets or any equivalent partitions for work stations approved by the concerned government authorities.

Glass partition systems

Modular partition system of aluminum stainless steel Rail colors with panel options of aluminum, wood veneer, vinyl. The system accommodates tempered, laminated, low iron and LCD glazing, and may also be of a straight, angled or curved configuration. LCD, pivot, sliding and hinged doors may be installed. Wood and glass doors (single glazed and double-glazed) are all compatible within the freestanding system. The fittings may be of an aluminum finish, standard RAL color (Jet Black, Silver, Grey or White) or a custom RAL colour.

Double glazed frameless partition System provides the transparency of glass yet the acoustic rating of a solid wall and with integral operable blind privacy option. With an STC wall rating of 44 and a door rating of up to 41, the system is ideal for interior offices, conference rooms, meeting rooms and atriums. Optional Fire resistance rated assemblies provide up to a rating of 60 minutes. The 1"x4" aluminum track accommodates tempered, laminated, low iron and Lunar Smart Glass glazing and may be of standard or custom RAL colour. The track may also be of a straight or curved configuration. Pivot, sliding and hinged doors may be installed. Wood, steel, aluminum and glass doors (single glazed and double glazed) are all compatible within the double-glazed system.

Free Standing Partition System offers the utmost versatility in creating and customizing rooms. The system stands independently in combination with stainless steel components and toughened glass panels. The need for head fixing is not required in most applications, single point wall and floor fixings are all that are needed. The system accommodates tempered, laminated, low-iron and LCD glazing, and may also be of a straight, angled or curved configuration. LCD, pivot, sliding and hinged doors may be installed. Wood and glass doors (single glazed and double glazed) are all compatible within the free-standing system. The fittings may be of a brushed finish, standard RAL colour or a custom RAL colour.

Mullion High Wall System offers a flexible and modular separation of spaces with a contemporary look. Its design allows for the movement/reconfiguration/relocation the connection elements without making holes in

the main support structure. Glass, poly-carbonate and wood are all compatible with the support components. All perimeters are fastened to solid walls.

2.3 WIRE CUT CLAY BRICKS

High Quality Wire cut clay bricks for façade treatment. Clay burnt smooth finished bricks has high cooling effect cutting of the major incoming heat to the internal spaces.

Schedule C - Project Facilities

The MSI shall construct the Project Facilities in accordance with the provisions of this Schedule C. Such Project Facilities shall include:

1. Architectural

a) COC building

- Provision for helipad landing and allied facilities like traffic control hut, integral firefighting, lighting, wind sock to be integrated in the design..
- Finish floor to finish floor height is 4.5mt height for office spaces and stilt floor height of 3.6 mtr to be provided.
- Facelift for compound wall and existing shops around the proposed building integrating with the building architecture and provision for Screens on shops to be provided for advertisement space and real time data projection.
- All services and utility equipment's at Terrace to be concealed in a proper space creating terrace gardening or any equivalent solution as per the design Facade Systems
- Car Parking provisions – 180 ECS

b) Utility Corridor

- All services routed through an underground trench as a part of utility corridor..

2. Landscaping facilities

- OAT for 100-135 people informal seating of approx size (15.4mt x 9.25mt) with visible materials, exposed concrete, artificial glass, locally available stones as architectural features, stair riser low level indicators, optional perimeter led lights for night view and aerial viewing, should have provisions for service cabling any other equivalent options as per design.
- Public covered seating space connecting the pedestrian pathways, with locally available stone as primary material for construction or any other equivalent as per the description.
- Cafeteria (coffee shop) with outdoor seating and integrating with gazebos and lawns or any other equivalent as per the design.
- Lawns and earth mounds with lighting ballads, strip lighting and lamp posts along the pathways.
- Sculptures showcasing the Tirupati as context.
- Hard scape including sit outs finished with sandstone under the trees, in the lawn, paving and flooring as per tender drawings.

3. Civil and Structural

- Earthquake preventive measures: Earthquake cannot be prevented. However, earthquake can be sustained by designing earthquake resistant structures using Indian Standards.
- Disaster (flooding) resistant building design:
    - Elevating as much of the building as possible above the design flood level.
    - Designing the building foundation and any portions subject to flooding to withstand design flood conditions and loads.
    - Using flood damage resistant materials for any portions of the building below the design flood level.
    - Local inhabitants have adopted strategy to overcome problem of flooding, by a raised plinth.

4. Ancillary facilities

Ancillary facilities shall be provided in accordance with the provisions as per Schedule B& D and shall include:

- External signages like building name, entrance gate, including its illumination and Internal signages like entry, exit, toilets, office etc.

5. Electrical Power Supply

The building will have to be provided with permanent electrical supply, DG & UPS backup power facilities in accordance with the provisions as per Schedule B & D.

Electrical facilities shall include

- 2 x 1250 / 1500kVA, prime rated, 415V, 50Hz, DG sets with associated accessories.
- Normal and emergency light fixtures.
- Building facade lighting, gate illumination, bollards etc.

6. HVAC

The building will be provided with air conditioning, mechanical ventilation and exhaust facilities in accordance with the provisions as per Schedule B & D.

HVAC facilities shall include:

1. Air cooled chillers shall be provided as standby in terrace of building.
2. Dual coil AHU with DX condensing units as standby for command & control centre of building.
3. Copper piping with insulation for DX condensing units & VRV system.
4. Variable Frequency Drive (VFD) for Secondary & condenser water pumps, cooling towers and AHUs.
5. Pot strainer, air separator, automatic closed type expansion tank etc.
6. Ventilation system for complete toilets, electrical rooms of COC building.
7. Chilled water piping with insulation.

7. Firefighting facilities

The building will be provided with Firefighting facilities including wet risers, sprinklers, fire hydrants and portable fire extinguishers in accordance with the provisions as per Schedule D & I and requirements of the statutory authorities.

Firefighting facilities shall include:

- Underground (UG) and Terrace level water tanks for firefighting system
- Fire pumps, external and internal hydrant pumps, sprinkler pumps, jockey pumps - electric & diesel engine driven
- Piping connection between UG tanks to the suction header, pump connections, further distribution with required valves, accessories etc.
- Required electrical MCC cum instrument control panels with controls like pressure switch etc. to make the system to work automatically.
- Fire extinguishers, internal hydrants and yard hydrants.
- Piping connection between OHT to the wet riser with required valves, accessories etc.
- Internal hydrants with hose reel box, fire hoses, nozzle etc. at each level.
- Piping, valves, accessories required for the complete system.

8. Plumbing and Sanitary facilities

The building will be provided with sanitation facilities including fully functional and equipped washrooms and potable water supply in accordance with the provisions as per Schedule B & D.

Sanitary facilities shall include:

- Underground (UG) water tanks for each potable, non-potable and firefighting system in basement of building.
- Individual transfer pumps (working & standby) for each system (potable and non-potable) in building.
- Booster pumping systems with sensor are proposed for top 3 levels of each building.
- Complete sewage, waste and rain water piping.
- Complete water supply (both potable & non-potable) distribution from OHT to each level.
- Piping connection between UG tanks to the suction header, pump connections etc.
- Sanitary fixtures and fittings.
- Piping, valves, accessories required for the complete system.
- Rain water collection from roof top to reflection pool

9. GRIHA related facilities

Appropriate drawings and details to be submitted along with photographs. Following facilities are to be provided on site during / post construction.

- Dedicated covered storage for HVAC material and equipment. Storage area should be clean and dry.
- Soil erosion and sedimentation control measures.
- Waste collection and segregation area in Building Campus.

Refer to GIRHA Scope of works for detailed requirements.

10. Road and Pavement facilities

Road and Pavement facilities shall be provided in accordance with the provisions as per Schedule B & D and shall include:

- Pedestrian Facilities like waste collection bins at every 50 m.
- Street Lighting: Street lighting within Right of Way as per road plans. This work comprises of poles & fixtures, lighting cables, optical fiber cables, controllers etc. 50% solar powered and 50% LED used alternately for internal driveways and parking.

S. No.	Element	Proposed Illumination Level (Lux)
1	Cycle track and Parking area	20 lux
2	Roads	30 lux

Schedule D - Specifications and Standards

All designs, materials, works and construction operations shall conform to the Standards and Specifications given below.

Where the MSI intends to use an alternative to these Standards/Guidelines for delivering an equal or better product, he shall be permitted to use such alternative subject to the following conditions:

He shall demonstrate that the proposed alternatives conforms to any of the following international Standards, Codes of Practice, Specifications, Guidelines, etc.

In case the Consultant intends to use any alternative material/technology/method, whether patented or otherwise, that is not specifically covered in the Indian or International Standards as listed above, but the use of which has been permitted on similar projects (similar in category of buildings) as the Building Projects, he would be permitted, its use on certification by the owners of such similar projects regarding the continued successful performance of such materials, technologies, methods, procedures or processes for at-least 5 years of the service life of the project. Such a certification shall be supported with details of critical performance parameters.

Such other reference standards published by the following that may be considered:

DIN	Deutsche Industries Norman (German Standards)
AFNOR	Association Francaise de Normalisation (French Standard Institute)
BSI	British Standard Institute
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute

The above is the list of codes included for guidance and compliance with applicable portions only and the omission of any from the list does not relieve the MSI from compliance therewith.

Latest version of the Codes, Standards, Specifications, etc., notified/published at least 60 days before the last date of bid submission shall be considered applicable.

Where the Standards and Specifications for a work are not given, Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

1. STRUCTURE WORKS

Standards and Specifications of following project components are given in this section;

- Structure design works should follow the latest applicable IS codes and the updates thereof.

  The Structure works design shall comply with the all the specified minimum requirements of the Authorities Structures analysis , design and detailing works shall be done by the latest software's.

- The Structural design shall be vetted by a Accredited Structural Engineer approved by the Client. This approved design shall form the basis of Construction.

1.1 The relevant Indian Standard Codes, as given below, shall be followed for structural design:

Table 1: Code for structural works

Code	Description
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 material.
IS-875 (Part 2) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Imposed loads.
IS-875 (Part 3) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Wind loads.
IS-875 (Part 4) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Snow loads.
IS-875 (Part 5) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Special loads and load combinations.
IS: 456 – 2000	Code of Practice for Plain and Reinforced Concrete.
IS: 1786 - 1985	Specification for High Strength Deformed Bars and Wires for Concrete Reinforcement
IS: 432 (Part 2) - 1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement – Hard Drawn Steel Wire.
IS: 1343 – 1980	Code of Practice for Prestressed Concrete
IS: 13920 - 1993	Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice
IS: 14268 - 1995	Uncoated Stress Relieved low relaxation seven-ply strand for Pre stressed Concrete – Specification
IS: 2062 – 1999	Steel for General Structural Purposes. Specification.
IS: 1161 – 1998	Specification for Steel tubes for Structural Purposes.
IS: 800 – 1984	Code of Practice for General Construction in Steel.
IS: 1893 – 2002	Criteria for Earthquake resistant design of structures.
IS: 2210 – 1998	Criteria for Design of Reinforced Concrete structures and Folded plates.
IS : 269 – 1989	Specification for Ordinary, rapid hardening and low heat Portland cement.
IS : 455 - 1989	Specification for Portland blast furnace slag cement.
IS : 1489 -1991	Specification for Portland pozzolana cement
IS : 383 - 1970	Specification for coarse and fine aggregates from natural sources for concrete.
IS : 516 -1959	Method of test for strength of concrete.
IS : 432 -1982	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
IS : 4990 -1993	Specification for plywood for concrete shuttering works
IS : 2645 -1975	Specification for integral cement water proofing compounds.

- Deviations – The Followings deviations from the Table above to be applicable.
- Table 2 indicates the Loads to be considered for the design of the Structure.

TABLE No – 2

Loading Area	**Load Intensity (KN/m2)**
Inaccessible Roof	0.75
Accessible Roof	1.50
For Sloping Roof with slope greater than 10 degrees (if applicable)	0.75 kN/m2 less 0.02 kN/m2 for every degree increase in slope over 10 degrees, subject to a minimum of 0.40 kN/m2
Terrace Roof Slab (with landscape)	3.00
Terrace Roof Slab (without landscape)	3.00
Office Floor Slab (BPO / IT - typical)	4.00
Balconies, Corridors, passages, lobbies and staircases including fire escapes – as per the floor serviced (excluding stores)	4.00
Storage Area	5.00
Pantry	3.00
Kitchen	3.00
Cafeteria	4.00
Toilets	2.00
Electrical room (H T/ LT Panel room)	5.00
AHU / HUB	5.00
Mechanical room	5.00
UPS rooms/Transformer/Battery room	10.00
Data Center/Server	12.50
Training	5.00
Library	5.00
Lobby	5.00
Activity Center/Meditation/Yoga	5.00

Loading Area	Load Intensity (KN/m2)
Gymnasium	7.00
Administration room	5.00
Auditorium (without fixed seating)	5.00
Pump house	5.00
Control Panel	10.00
Compactor storage areas	10.00
Chiller room	18.00
DG room	20.00
Parking/ Ramp	5.00
Landscape/ Lawn	5.00

The surcharge loading for retaining walls shall be minimum of 10.0 kN/m2.

2. ARHITECTURE & FINIHING WORKS

- The Codes, Standards and Technical Specifications applicable for the design and construction of project components are:
- The following list is included for guidance only and the omission from the list does not relieve the MSI from compliance there with:

Table 3: Codes for Architectural and Finishes

Code	Description
IS 1200	Mode of measurement.
IS 269	Ordinary portland cement.
IS 3812, 1981	Flyash for use as pozzolana and admixtures,
IS 2386	Method of test for aggregate for concrete.
IS 516	Method of test for strength of concrete
	Coarse and fine aggregate from natural sources for concrete.
IS 1077, 1970	Method of test for Bricks.
IS 456	Code of practice for plain and reinforced concrete.
IS 1597	Code of practice for construction of stone masonry.
IS 1597 PART 1	Code of practice for construction of rubble stone masonry.
IS 1130	Marble (blocks, slabs and tiles)
IS 287	Recommendation for maximum permissible moisture contents of Timber used for different purposes.
IS 1141	Code of practice for seasoning of timber.
IS 6313 PART 2	Anti-termite measures in buildings, pre-constructional chemical treatment measures.
IS 2571	Code of practice for laying in situ cement concrete flooring
IS : 226	Structural Steel (Standard Quality)
IS : 451	Technical Supply Conditions for Wood Screws
IS : 800	Code of Practice for Use of Structural Steel in General Building Construction
IS : 806	Code of Practice for Use of Steel Tubes in General Building Construction
IS : 813	Scheme of Symbols for Welding
IS : 814	Covered Electrodes for Metal Arc Welding of (part I & II) Structural Steel
IS : 816	Code of Practice for Use of Metal Arc Welding for General Construction in Mild Steel
IS : 822	Code of Practice for Inspection of Welds

Code	Description
IS : 961	Structural Steel (High Tensile)
IS 73	Paving bitumen.
IS 702	Industrial Bitumen
IS 1322	Bitumen felts for waterproofing and damp proofing.
IS 1609	Code of practice for laying damp proof treatment using bitumen felts.
IS 13711 & 13712	Ceramic tiles
IS 13630 Part 1 to 13	Testing for Ceramic tiles
IS 104	Specification for ready mixed painted, brushing, zinc chrome, priming.
IS 137	Ready mixed paint, brushing, matt or eggshell flat, finishing, interior to Ind standard colour as required.
IS 5410	Cement paint, colour as required.
IS 6241	Method of test for determination of stripping value of road aggregate.
IS 2720	Density test of aggregate.

3. ELECTIRCAL WORKS

Standards and Specifications for the Design and Construction of Electrical works are given in this section;

3.1 BACKGROUND

The MSI shall comply with all the minimum requirements of the Design and Construction of Electrical works as per the Latest Standards, Statutory requirements, National Building codes and all other relevant regulations

3.2 CODES AND STANDARDS

The system, design, materials, equipment, installation, testing and commissioning shall, in addition to all other applicable codes and standards, comply with the latest requirements of the following standards, codes, principles and specifications issued by Indian standards or IEC codes :-

Table 4: Codes for Electrical Works

Codes	Description
IS 335	Insulating oil
IS 2026	Power transformers (part I - V)
IS 10028	Code of practice for selection, installation and maintenance of transformers
IS 2099	Bushing for alternating voltages above 1000 V
IS 4257	Porcelain bushings for transformers
IS 3639	Power transformer fittings and accessories
IS 2705	Current transformers
IS 8468	On load tap changer
IS 8478	Application guide for tap changers
IS 6600	Guide of loading of oil immersed transformer
IEC 2544	Creepage distance for insulators & bushing congenial
IEC 76	Power transformers
IEC 214	On load tap changers
IEC 616	Terminal and tapping markings for power transformers
IEC 551	Determination of transformer and reactor sound levels.
IEC 137	Bushings for alternative voltage above 1000V.
IEC 354	Loading guide for oil immersed transformer
IS: 3043	Code of practice for earthing.
IEEE: 32	Neutral Grounding Devices, standard requirements, Terminology & procedure.
IS 1271	Classification of Insulating Materials.
IS 2099	Bushing for alternating voltages above 1000 V
IS 2705	Current transformers

Codes	Description
IS 3202	Code of practice for climate proofing
IS 3639	Power transformer fittings and accessories
IS 4257	Porcelain bushings for transformers
IS 11171	Dry type Transformer
IS 8478	Application guide for tap changers
IS10028	Code of practice for selection, installation and maintenance of Transformers
IS 1248 & 3107	Direct acting Electrical indicating instruments
IS 2099	Bushings for alternating voltages above 1000V
IS 2516	AC Circuit Breakers
IS 2705	Current Transformers
IS 3156	Voltage Transformers.
IS 3427	Metal enclosed switchgear and control gear for voltages Above 1000V but not exceeding 11000 V
IS 6875	Control switches for voltages up to and Including 1000V AC and 1200 V DC
IEC 56	HV alternating current circuit breakers.
IEC 137	Bushings for alternating voltages above 1000V
IEC 298	AC metal enclosed switchgear and control gear for rated voltages above 1kV and up to and including 72.5 kV.
IS 2147	Degree of protection for enclosure
IS 3842	Specification for electrical relays for AC system
IS 2208	Specification for HRC cartridge fuse links up to 650 Volts.
IS 5082	Wrought Al. And aluminum alloys, bars, rods, tube and Sections for electrical purposes.
IEC 694	Common clauses for high voltage switchgear and control gear standards
IS 1248 & 3107	Direct acting Electrical indicating instruments
IS 2959	AC contactors up to 1000V
IS 13947	AC Circuit Breakers
IS 2705	Current Transformers
IS 3156 & 4146	Potential Transformers.
IS 4047	Specification for air break switches and combination fuse switch units for voltage not exceeding 1000V.
IS 6875	Control switches for voltages upto and including 1000V AC and 1200V DC.
IS 1822	Motor duty Switches

Codes	Description
IS 12021	Specification for control transformer.
IS 8623	Factory built assembly of switchgear & control gear for voltage not exceeding 1000V
IS 13947 (Part I)	Degree of protection for enclosure
IS 3842	Specification for electrical relays for AC system
IS 2208 & 9224	Specification for HRC fuses.
IS 5082	Wrought Al. and aluminum alloys, bars, rods, tube and sections for electrical purposes.
IS 4237	General requirement for switchgear & control gear for voltage not exceeding 1000V.
IS 3231	Electrical relays for power system protection
IS 375	Marking and arrangement for switchgear bus bars, main connection and control aux. wiring.
IS 5578	Guide for marking of insulated conductors.
IS 3618	Pre-treatment of MS sheets for phosphatising.
IS: 4722	Specification for rotating machinery
BS: 649	Performance and testing of diesel engines for general purposes.
IS 4729	Measurement and evaluation of vibration of rotating electrical machines.
IS 1950 (1962)	Code of Practice for Sound insulation of Non Industrial Buildings.
IS 8084-1976	Interconnecting bus bars for AC voltages above 1kV
IS 8623 (part-2)	Factory built assemblies-particular requirements of bus bar trunking systems.
IEC 439 (part-2)	Particular requirements of bus bar trunking systems
IS 13925	Shunt capacitors for power system
IS 3231	Electrical relays for power system Protection
IS 2705	Current Transformers
IS 1248	Direct acting electrical indicating instruments
IS 2147	Degree of protection
IS 5578	Marking & arrangement of switchgear, bus bars, main connection and auxiliary wiring
IS: 1554 (PART-I)-	PVC insulated (heavy duty) electric cables working voltage up to and including 1100V
IS: 7098 (PART-II)	Cross-linked polyethylene insulated PVC sheathed cables for working voltages from 3.3 kV up to and including 33 kV
IS: 8130	Conductors for insulated electric cables and flexible cords.
IS: 5831	PVC insulation and sheath of electric cables.

Codes	Description
IS:3975	Mild steel wires, strips and tapes for armoring of cables.
IS:2633	Methods of testing weight, thickness and uniformity Of coating on hot dipped galvanized articles.
IS: 209	Specification of zinc.
IS: 3961(PART-II)	Recommended current ratings for PVC insulated And PVC sheathed heavy duty cables.
IS: 10418	Wooden drums for electric cables.
IEC: 540 & 540A	Test methods for insulation and sheaths of electric cables and cords.
IS: 10462 (PART I)	Fictitious calculation method for determination of dimensions of protective coverings of electrometric and thermoplastic insulated cables.
IS: 10810 (PART 58)	Oxygen Index test
IEC 146	Semiconductor Converters
IEC 1131-2	Programmable Controllers
IEC Publication 947, 1988	
IEC Publication 439, 1985	
IS 13947, 1993	Specifications of Low Voltage Switchgear & Control Gear
IS 8623, 1993	Specifications of Low Voltage Switchgear & Control Gear assemblies.
Indian Electricity Act, 1910	
Indian Electricity Rules, 1956	
National Electrical Code 1985	
EN50081-1	EMI Emissions standard
EN50082-1	EMI Immunity standard
Electrical safety	EC730-1and CE directives effective from 1 January 1996.
IEC 146-4	Method of specifying the performance and test requirements
IEC 146-5	Switches for UPS
IEC 439	Low Voltage switch gear and control gear assemblies
IEC 801	Electromagnetic compatibility for industrial process Measurement
IEC 950	Safety of IT equipments including electrical business equipments
1000-2-2	Electromagnetic compatibility – Compatible levels for low frequency conducted disturbances and signaling in public low voltage power supply systems
1000-4	Electromagnetic compatibility – Testing & measurement techniques
IS 3043	Code of practice's for earthing in Electrical installation.
IEEE 1100	Recommended practice for powering and grounding of sensitive Electronic equipment.

4. HVAC WORKS

Design Parameters

- Water cooled chillers:

Chilled water entering temperature at chiller	-	54 Deg F (12.22 Deg C)
Chilled water leaving temperature at chiller	-	44 Deg F (6.67 Deg C)
Fouling factor for chiller in FPS unit	-	0.0005
Condenser water entering temperature at chiller	-	88.6 Deg F (31.45 Deg C)
Condenser water leaving temperature at chiller	-	98.6 Deg F (37 Deg C)
Fouling factor for chiller in FPS unit	-	0.001
Refrigerant (HCFC free)	-	HFC134a
Max. IKW/TR at design conditions (100% load)	-	0.64
Min. COP at ARI conditions (100% load)	-	6.0
Min. IPLV	-	6.5

Air cooled chillers:

Chilled water entering temperature at chiller	-	54 Deg F (12.22 Deg C)
Chilled water leaving temperature at chiller	-	44 Deg F (6.67 Deg C)
Fouling factor for chiller in FPS unit	-	0.0005
Refrigerant (HCFC free)	-	HFC134a
Max. IKW/TR at design conditions (100% load)	-	1.3
Min. COP at ARI conditions (100% load)	-	3.1
Min. IPLV	-	3.45

Air Handling Units (AHU):

Maximum face velocity across pre-filters	-	500 fpm
Maximum face velocity across MERV-13	-	500 fpm
Maximum face velocity across cooling coils	-	500 fpm
Maximum fan outlet velocity	-	1800 fpm
Maximum fan speed		
Impeller dia above 450mm	-	900 rpm

Impeller dia 450mm and below - 1500 rpm

Air Distribution System:

Maximum flow velocity in AC ducts - 1500 fpm

Maximum flow velocity in ventilation ducts - 1500 to 2200 fpm

Maximum friction in AC & ventilation ducts - 0.1 inches per 100 feet

Piping shall be sized for the following design parameters:

Maximum velocity 1.2 m/Sec (4 fps) for piping 50 mm & under

2.5 m/Sec (8.2 fps) for piping over 50 MM dia

Maximum friction 15 k Pa per 30 M Run (5 ft per 100 ft Run)

CODES AND STANDARADS

The system, design, materials, equipment and installation shall comply with all other applicable codes & standards and issued by:-

Table 5: Codes for HVAC Works:

Codes	Description
	National Building Code 2005
	Energy Conservation Building Code 2008
ASHRAE 90.1-2009	ANSI/ ASHRAE/ IESNA standard 90.1-2009: Energy standard for buildings except low rise residential buildings.
	AMCA : Air Movement and Control Association
	ARI - American Refrigeration Institute
AHRI 410-2001 with Addenda 1, 2 and 3	Forced-Circulation Air-Cooling and Air-Heating Coils
ANSI/AHRI 430-2009	Central Station Air Handling Units
ANSI/AHRI 440-2008	Performance Rating of Room Fan-Coils
AHRI 550	Standard for centrifugal or rotary screw water chilling packages.
AHRI 575	Standard for method of measuring machinery sound within equipment room.
ASME: Section VIII Div.1	Code for Unfired Pressure Vessels Section VIII (Design; construction, testing and certification of pressure vessels) with 'U' stamping
ANSI B31.5	Code for Refrigeration piping
ASME B31.1	Code for Process piping

Codes	Description
	Cooling Technology Institute, CTI
ATC-105-00	Acceptance Test Code for Water-cooling Towers (CTI Std-103 Code Tower Standard Specifications).
ATC-201-96	Standard for Certification of Water Cooling Tower Performance (CTI Code Tower Standard Specifications).
ISO 2858, 5199	Specifications for pumps
ASHRAE 52.1-1992	Air Filters
ASHRAE 62-1-2007	Indoor Air Quality
	Duct Fabrication as per SMACNA
IS : 277 – 1977	GI Sheets
IS : 737	Aluminum Sheets
IS : 325	Three-phase induction motors
IS : 659	Safety code for air conditioning,
IS : 660	Safety code for mechanical refrigeration
IS : 4671	Expanded polystyrene for thermal insulation purposes
IS : 4894	Centrifugal Fans
IS : 1239 & IS 3589	Pipe & Pipe Fitting
	Fire Damper UL555, CBRI approved
IS : 659 – 1964 (Reaffirmed 1991)	Air conditioning (Safety Code)
IS : 660 – 1963 (Reaffirmed 1991)	Mechanical Refrigeration (Safety Code)
BS : EN:779 – 1993	Filters
ASHRAE Hand Books	American Society of Heating Refrigeration & Airconditioning Application 2007. Fundamentals 2005. Refrigeration 2006. Systems & Equipment 2008. ASHRAE Indoor air quality Standard 62.1-2007. ASHRAE 90.1-2007 ASHRAE 55-2004 ASHRAE 52.1 and 52.2
IEC	Relevant Sections.

5. FIRE FIGHTING WORKS REQUIREMENTS

- The design shall comply with rules of the local fire service department / authorities.

The Fire Protection System design shall be based on the following codes & Standards:

Table 6: Codes for Fire Fighting Requirements

Codes / Specifications	Description
National Building Code 2005	Part 4, Fire & Life Safety
Tariff Advisory Committee (TAC)-12th Edition-1998	Fire Protection Manual
Tariff Advisory Committee (TAC)-1998 Edition	Rules for automatic Sprinkler Installations
Tariff Advisory Committee (TAC)	Rules for Water Spray System
IS:3844-1989 (1995)	Fire Protection Manual
IS:13039:1991	Fire Protection Manual
IS 15105: 2002	Design and Installation of Fixed Automatic Sprinkler Fire Extinguishing System-Code of Practice
IS 12459: 1988	Code of Practice For Fire Safety In Cable Runs
IS 12469: 1988	Fire Fighting Pumps
IS 5120: 1977	Technical requirement for Rotodynamic Special Purpose Pumps
IS 325: 1996	Three-Phase Induction Motor
IS 3042: 2003	Specification For Single Faced Sluice Gates
IS 2190: 2010	Selection, Installation and Maintenance of First-Aid Fire Extinguishers-Code of Practic
IS 15683:2006	Potable Fire Extinguishers - Performance and Construction Specification
IS 5: 1994	Colours for Ready Mixed Paints and Enamels (Fourth Revision)
IS 1239 (part-I): 1990	Mild Steel Tubes, Tubular and Other Wrought Steel Fittings: Part-I Mild Steel Tubes (Fifth Revision)
IS 1239: (Part-II): 1992	Mild Steel Tubes, Tubular and Other Wrought Steel Fittings: Part-II Mild Steel Tubular and Other Wrought Steel Pipe Fittings (Fourth Revision)
IS 3589: 2001	Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside Diameter) – Specification (Third Revision)
IS 6392: 1999	Specification for Steel Pipe Flanges (Seventh Reprint)

IS 12835: Part I: 1989	Code of practice for design and installation of fixed fire extinguishing system Part 1 Low expansion foam
IS:10221:1982	Code of Practice for Coating & Wrapping of underground Mild Steel Pipe Lines
IS: 5290:1983	Specification for Valve Landing (Second Revision)
IS:8442:1977	Specification for stand post type water monitor for fire fighting
IS:636:1988	Non-percolating flexible fire fighting delivery hose
IS:8423:1977	Specification for Controlled percolating hose for fire fighting
IS:4927:1968	Specification for unlined flax canvas hose for fire fighting (Amendment Nos. 1 & 2)
IS:903:1984	Specification for Fire Hose Delivery Couplings, Branch Pipe, Nozzles and Nozzle Spanner (Third Revision)
IS:906:1988	Specification for branch with revolving head for fire fighting purposes
IS 907: 1984	Specification for suction strainers, cylindrical type for fire fighting purposes(second revision)
IS:2871:1983	Specification for branch pipe, universal for fire fighting purposes (First revision)
IS: 884:1985	Specification for First Aid Hose Reel for fire fighting (First Revision) (Amendment No.1)
IS:940:1989	Specification for Portable Fire Extinguisher (Gas Pressure)
IS:2171:1985	Specification of Portable Fire Extinguisher, Dry Powder (Cartridge Type) (third Revision)
IS:2878:1986	Portable & Trolley Mounted CO2 type fire extinguisher (Third Revision)
IS:4947:1985	Specification for Gas Cartridges for use in fire Extinguishers-CO2 type (Second Revision) (Amendment Nos. 1 and 3)
IS:944:1979	Functional requirements for 1800 L/min. Trailer pump for Fire brigade use.(Second Revision) (Amendment No. 1)
IS:946:1977	Functional requirements for Engines for Motor Fire Engines (First Revision)
IS:947:1985	Functional requirements for towing tender for trailer fire pump for Fire brigade use (First Revision)
IS:10001, IS:10002	Diesel Engine-General Purpose
IS:13095: 1991	Butterfly valves
IS: 14846	Sluice Valves for Water Works 50-1200mm
IS: 9890	Ball Valves for General Purposes
IS 3624: 1987	Pressure and Vacuumed Gauge (Second Revision)
IS 2097: 1983	Specification for foam making branch pipe (first revision)
IS: 5312	Specification for Swing Check Valve

ASME B 36.10	Welded and Seamless Wrought Steel Pipe
BS:5150	C.I. Gate Valves/ Rising Stem types PN 16
BS:5153	C.I. Reflux Valves/Check Valves (Swing Type) PN16
BS:1414	Steel Wedge Gate Valves
BS:1868	Steel Check Valves
NFPA 1	NFPA Fire Prevention Code
NFPA 10	Standard for Portable Fire Extinguishers 1998 Edition
NFPA-11	Standard for installation of Low expansion Foam system
NFPA-13	Standard for installation of Sprinkler System
NFPA-15	Standard for Water Spray fixed system for the fire protection system
NFPA-20	Standard for the Installation of Stationary Pumps for Fire Protection
NFPA-2001	Standard on clean agent fire extinguishing system
NFPA-25	Standard for the Inspection, Testing, and Maintenance of. Water-Based Fire Protection Systems
NFA-16	Standard for installation of Foam water sprinkler system or Foam water spray system
NEMA	National Electricity Manufacturers Association
IEEE	Institute of Electrical and Electronic Engineers
ISA	Instrumentation, Systems and Automation society
ANSI	American National Standards Institute
DIN	Deutsche Industries Norman
IEC	International Electrochemical Commission
VDE	Verin Deutschar Eisecnhuttenleutte
ISI	Indian Standard Institute
BS 5839	Code of practice for installation of fire alarm system
IS 2189	Code of practice for installation of automatic fire alarm system
IS:817/2008	Welded joints
UL / FM	Underwriters Laboratory / Factory Manual

6. PLUMBING WORKS SYSTEM

6.1 WATER SUPPLY SYSTEM

CODES AND STANDARADS

Unless specifically mentioned otherwise, all the applicable codes and standards published by the Bureau of Indian Standards and their subsequent revision shall govern in respect of design, workmanship, quality and properties of materials and method of testing.

The material supplied shall comply with the latest applicable Indian and / or British Standards. Other National Standards are acceptable, if they are established to be equal or superior.

Following codes and standards are made part of this specification:

Table 7: Codes for Plumbing Works

IS 10446 – 1983	Glossary of terms relating to water supply and sanitation.
IS 7558-1974	Code of practice for domestic hot water piping installations
IS 2692-1989	Specification for Ferrules For Water Services.
IS 1239	Mild steel tubular and other wrought steel pipes and fittings (Part-I)
IS 1239	Mild steel tubular and other wrought steel pipes and fittings (Part-II)
IS 779 -1978	Specifications for Water Meters - Domestic Type
IS 2104 – 1981	Specification for water meter boxes (Domestic type).
IS 2401–1973	Code of practice for selection, installation, and maintenance of domestic water meters.
IS 7413-1981	Insulation Material
IS 2065 –1983	Code of practice for Water Supply In Buildings (Second Revision)
IS 778- 1984	Specifications for copper alloy Gate, Globe And Check Valves for water supply purposes.
IS 1703 – 1977	Specification for ball valves (horizontal plunger type) including floats for water supply purposes.
IS 3004 – 1979	Specification for plug cocks for water supply purposes.
IS 3950 – 1979	Specifications for surface boxes for sluice valves.
IS 9338 – 1984	Specification for cast iron screw-down stop valves and stop and check valves for water works.
IS 4346 – 1982	Specification for washers for use with fittings for water services.
IS 5219 – Part 1	Specification for cast copper alloy traps – Part1 1982
IS 5312 – part 1	Specification for swing check type reflux (Non-return) 1969 valve for water works purposes part 1 single door pattern
IS 13049 – 1919	Diaphragm type (plastic body) float operated valve for cold water services – specification.
IS 13114 – 1991	Forged brass gate, globe and check valves for water works purposes – specification.

IS 14399 – part 1	Hot press moulded thermosetting glass fibre reinforced & Part 1 – 1996 polyester (GRP) resin sectional water storage tanks.
IS 310 –1965	Code of Practice for Water Supply
SP –35	Handbook of water supply and drainage (with special emphasis on plumbing)
IS 1172-1983	Code of Basic Requirement For Water Supply, Drainage & Sanitation (Third Revision)
IS 12183	Code of practice for Plumbing In Multi- Storey buildings Part I) – 1987 (Part 1 water supply)
IS 1200 - 1992	Method of Measurement Of Building And Civil Engg. Works.(Part 1 earthwork)
IS 2379 –1963	Specification of colour code for the identification of pipes.
SP 7 – 1983	National building code of India (Part IX – Plumbing services)
IS 2401 – 1973	Code of practice for selection, Installation and maintenance of domestic water meters.
IS 780-1984	Specification for Sluice valves for water works purposes (50 to 300mm size) (Sixth Revision)
	The MSI shall comply with the water requirement, water supply lines and sewer lines as per the following manuals and Standards.
CPHEEO	Manual on water supply and treatment
CPHEEO	Manual on sewerage and sewage treatment

- All the requirements must be in accordance with the statutory / authorities requirements.

6.2 SANITARY AND SEWERAGE SYSTEMS

CODES AND STANDARADS

Unless specifically mentioned otherwise, all the applicable codes and standards published by the Bureau of Indian Standards and their subsequent revision shall govern in respect of design, workmanship, quality and properties of materials and method of testing.

Following [Table 8] are the standards and codes are made part of these specifications.

Table 8: Codes for Sanitary and Sewerage System

Codes	Description
IS 10446 – 1983	Glossary of terms relating to water supply and sanitation.
IS 11208 –1985	Guidelines for registration of Plumbers
IS 5382 – 1985	Specification for rubber sealing rings for gas mains, water mains and sewers.
SP – 35	Handbooks of water supply and drainage (with special emphasis on plumbing)
IS 1172-1983	Code of Basic Requirement For Water Supply, Drainage &Sanitation (Third Revision)

Codes	Description
IS 1200 - 1992	Method of Measurement Of Building and Civil Engg. Works.(Part 1 earthwork)
IS 2379 –1963	Specification of colour code for the identification of pipes.
SP 7 – 1983	National building code of India (Part IX – Plumbing services)
IS 1742 – 1983	Code Of Practice For Building Drainage (Second Revision)
IS 301 – 1971	Code of practice for Building Drainage
IS12251- 1987	Code Of Practice For Drainage In Basement
BS 5572 -1978 (Amendment No.2)	Sanitary pipe Works
BS 4660- 1973 (Amendment No.1)	PVC Underground Drain Pipes & Fittings.
IS 5329 – 1983	Code of practice for sanitary pipe work above ground for buildings First Revision)
IS 2527 – 1984	Code of practice for fixing rain water gutters and down take pipes for roof drainage. (First Revision) I
IS 5961 – 1970	Specification for cast iron gratings for drainage purposes.
IS 2527 – 1984	Code of practice for fixing rain water gutters and down take pipes for roof drainage. (First Revision)
CPHEEO	Manual on sewerage and sewage treatment
IS 1626 (Part 1)	Specification for asbestos cement building pipes and pipe –1980 fittings, gutter and gutter fittings, and roof fittings

7. FIRE DETECTION ALARM SYSTEM

Following codes and standards are made part of this specification:

Table 9: Codes for Fire Detection Alarm System

Codes	Description
BIS 15908 -	Selection, Installation and Maintenance of Control and Indicating Equipments for Fire Detection and Alarm System--Code of Practice (2011)
IS:2189:1988	- Code of practice for selection, installation and maintenance of Automatic Fire Detection and alarm system (second revision)

8. BUILDING MANAGEMENT SYSTEM and SECURITY SERVICES REQUIREMENT

This details below explains briefly the Building Management, and Security Systems that are suggested for the project. Basic essential components of these systems are Design Parameters and Explanation on the areas of implementation of each system.

BUILDING MANAGEMENT SYSTEM

The BMS will perform the following general functions:

- Building Management & Control.
- Serve as operator Man – Machine interface.
- Managing and monitoring conditions (e.g. Temperature).
- Control monitoring.
- Notification of system faults and alarm controls.
- Data Collection & Historisation.
- Alarm Event & Management.
- Trending.
- Reports & MIS Generation.
- Maintenance & Complaint Management.
- Network Integration.

The BMS system consists mainly of the following components.

- Centralized control equipment in the main control room (BMS room) with graphic display for managing alarms, time programs and set values for technical systems and monitoring of individual air conditioning control.
- Substation and field controllers & sensors.

BMS facilitates the following utilities / areas:

- ACMV - Chiller's sequential start-up, loading, unloading, sequential shutdown and monitoring of important parameters for Chiller, AHU, Fans and Pumps.
- FCUs – time scheduled start-up / shutdown and control of AHUs / FCUs to maintain comfort levels in the occupied areas at minimum energy levels. Control of chilled water supply through actuators.
- Supply / Exhaust fans of smoke free lobbies - control and status monitoring.
- Switchboards - monitoring of important parameters and status for HV and LV Main Switchgear.
- Lighting Controls - control of common area lighting distribution boards.
- Elevators - Monitoring of important parameters and status.
- DG set- Monitoring of important parameter and status.
- Fire protection system.
- Monitoring of control panel, pumps and water tanks.
- Domestic and potable water system - control of pumps and monitoring of tanks and pumps.

- The system shall comprise controllers located near the equipment they monitor / control. Signals from this equipment shall be connected to the controllers. The controllers shall be connected to each other over a bus and terminated at the Man Machine Interface (MMI). The MMI shall include PCs and printers and serves as the operator's interface to the system.

- Common BMS and FCC room for the whole campus with future expansion to be planned

  The PC software shall feature a graphical user interface (GUI) for simplicity and ease of use. The software features shall include alarm presentation, report generation, trending of parameters, historical storage, maintenance schedule generation based on equipment run hours, programming of sequence schedules, implementation of duty cycling, etc.

9. GRIHA RATING SYSTEM

Following are the standards and codes are part of these specifications / guidelines:

Table 10

Codes / Specifications	Descriptions
GIRHA V 2015	5 star rating
ASHRAE 90.1.2007	Energy Standard for Buildings

10. ROAD WORKS

10.1 Roads and Parking Areas:

Standards and Specifications for Roads and Parking Areas are given in this section;

10.2 The Codes, Standards and Technical Specifications applicable for the design and construction are as given under;

i. Indian Roads Congress (IRC) Specifications, Standards, Design Codes

ii. IRC Special Publications

iii. Ministry of Surface Transport Publications (Now Ministry of Shipping, Road Transport & Highways) – Part A

iv. Policy circular/Advisory letters issued to all states/UTs on the matter pertaining to urban transport April 2008 – October 2014

Latest version of the Codes, Standards, Specifications, etc., notified/published at least 60 days before the last date of bid submission shall be considered applicable.

10.3 Standards and Specifications for Construction

The MSI shall comply with the Standards and Specifications for Construction of Roads and Parking Areas as given below.

All materials, works and construction operations shall conform to the Specifications for Road and Bridge Works (Fifth Revision, April 2013), issued by the Ministry of Road Transport & Highways (MoRT&H). Where the Standards and Specifications for a work are not given, Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

10.4 List of Standards : List of Standards is given in Table: 11

Table 11

Code/Document No.	Description
1. IRC: 3-1983	Dimensions and weights of Road Design Vehicles
2. IRC: 32-1969	Standard for vertical and horizontal clearances of Overhead electric power and telecommunication lines as related to roads
3. IRC: 35-1997	Code of Practice for Road Markings (with Paints) (First Revision)
4. IRC: 37 -2012	Tentative Guidelines for the Design of Flexible Pavements
5. IRC: 38-1988	Guidelines for the design of curves for Highways & Design tables (First Revision)
6. IRC: 56-2011	Recommended Practices for Treatment of Embankment and Roadside Slopes for Erosion Control (First Revision)
7. IRC: 67-2012	Code of Practice for Road Signs (Third Revision)
8. IRC: 69-1977	Space Standards for Roads in Urban Areas
9. IRC: 86-1983	Geometric Design Standards for Urban Roads in Plains
10. IRC: 93-1985	Guidelines on Design and Installation of Road Traffic Signals
11. IRC: 98-2011	Guidelines on Accommodation of Underground Utility Services

Code/Document No.	Description
	Along and Across Roads in Urban Areas (Second Revision)
12. IRC: 99-1988	Tentative Guidelines on the Provision of Speed Breakers for Control of Vehicular Speeds on Minor Roads
13. IRC: 103-2012	Guidelines for Pedestrian Facilities
14. IRC: SP: 23-1983	Vertical Curves for Highways
15. IRC: SP: 31-1992	New Traffic Signs
16. IRC: SP: 41-1994	Guidelines on Design of At-Grade Intersections in Rural & Urban Areas
17. IRC: SP: 44-1996	Highway Safety Code
18. IRC: SP: 50-2013	Guidelines on Urban Drainage
19. IRC: SP: 62-2004	Guidelines for the Design and Construction of Cement Concrete Pavement for Rural Roads
20. IRC: SP: 63-2004	Guidelines for the Use of Interlocking Concrete Block Pavement

11. SEWAGE TREATMENT PLANT

DESIGN BASIS FOR STP

Plant capacity

Package Sewage Treatment Plant (PSTP)

A PSTP will be planned, which will cater the sewage generated from COC Building.

Characteristics of Raw Water

Understanding of the nature of physical, chemical and biological characteristics of sewage is essential in planning, design and operation of treatment and disposal facilities and in the engineering management of environmental quality. The influent characteristics expected for domestic sewage is given Table.

Table 12: Influent Characteristics (Reference CPHEEO Manual for Sewerage and sewage treatment system)

SI. No.	Parameter	Values
1	pH	6.5 - 8.5
2	BOD5 @ 20°C, mg/L	250 – 300
3	COD	400 – 500
4	To	300 - 400
5	Oil and grease, mg/L	10 - 20
6	Total kjeldahl Nitrogen (as N), mg/L	40 - 50
7	Total Phosphorus, mg/L	5 - 7
8	Faecal Coliforms MPN/100 ml	10^6 to 10^8

Characteristics of Treated Sewage

It is proposed that the sewage which is generated is to be treated to such standards that it can be used for gardening, toilet flushing and washing of internal roads & paved areas.

From the point of view of better environment it is contemplated that the entire sewage will be treated to 5 mg/l (BOD and TSS) standards. The EPA standards for reuse of municipal sewage are given in Table 13.

Table 13: EPA Standard of Treated Sewage

Type of Reuse	All types of landscape irrigation, vehicle washing, toilet flushing, use in fire protection systems and commercial air conditioners and other uses with similar access or exposure to the water
Treatment	Secondary, Filtration, Disinfection
pH	6.5-8.5
BOD (mg/L)	≤ 5

Turbidity (NTU)	≤ 2
Faecal Coli/100mL	No detectable Faecal Coli
Residual Chlorine (mg/L)	1

- The reclaimed water should not contain measurable levels of viable pathogens.
- Reclaimed water should be clear and odourless.
- Higher chlorine residual and/ or a longer contact time may be necessary to assure that viruses and parasites are inactivated or destroyed.
- Chlorine residual of 0.3-0.5 mg/l or greater in the distribution system is recommended to reduce odours, slime, and bacterial re-growth.

Treated water from tertiary treatment of STP is proposed to be stored in a separate treated water tank near STP. This treated/ recycled water is proposed to be supplied for landscape & irrigation.

The reuse of the treated wastewater for the project area will be for gardening, toilet flushing, road washing, etc. Hence, expected standard will be as given in Table 14.

Table14: Treated Sewage Standards

Maximum limits/Type of Water usage	Unit	Minimum Values
Colour	-	Acceptable
BOD	mg/lit	< 20
COD	mg/lit	< 100
Residual Chlorine	mg/lit	<1
Faecal Coliform	mg/lit	No detectable Faecal Coli
Turbidity	NTU	<5*
pH		6.5-8.5
TSS	mg/lit	< 30

Residual chlorine for flushing water need not be >1 mg/l

* From Practical Consideration

12. SOLID WASTE MANAGEMENT SYSTEM

The following standards and codes and statutory requirements to be followed for design and implementation of the Solid Waste Management:

Table 15

Codes / Manuals	**Description**
CPHEEO	Manual on Municipal Solid Waste Management, Ministry of Urban Development, Government of India, 2000.
Guidelines by Supreme Court of India, 1999.	Solid waste management in class-I cities in India
[20/7/1998], S.O.630 (E), 1998.	Bio-medical waste (management and handling) rules
S.O. 2400(E), 1999.	Recycled plastic (manufacture and usage) rules
[25.9.2000], S.O. 908(E), 2000 and the amendment 2013.	Municipal waste (Management and Handling Rules),
	Batteries (Management and handling) Rules, 2001.
1999, S. O.705 (E), 2003.	Amendment to the Recycled Plastic Manufacturing and Usage Rules,
[17.9.2003], S.O.1069 (E), 2003.	Bio-Medical Waste (Management and Handling) (Amendment) Rules,
	Hazardous waste management and handling rule, 1989.
S.O.2265 (E), 2008	Hazardous Wastes (Management, Handling and Trans boundary Movements) Rules,.
S.O. 2400(E), 2009.	Plastics (Manufacture, Usage and Waste Management) Rules, [17.09.2009],
	E waste (Management and handling) Rules, 2011.

OTHER WORKS

13. PLANTATION OF TREES AND HEDGES.

13.1 Scope

The work shall consist of:

a) Planting of tree saplings in median or other designated locations.
b) Planting of hedges within median area.

13.2 Materials

13.2.1 Dump Manure

Dump manure shall be of well decayed (at least six months) organic or vegetable matter, obtained in the dry state from the municipal dump or other similar sources approved by the Employer's Engineer. The manure shall be free from earth, stone, brickbats or other extraneous matter.

13.2.2 Farmyard Manure

Farmyard Manure shall be well decayed (should be at least 6 months covered in dump), free from grits and any other unwanted materials.

13.2.3 Good Earth

The soil shall be agricultural soil of sandy-loam texture, free from kankar, murrum, shingle, stone, brickbats, building rubbish and any other foreign matter. The earth shall be free from clods or lumps of sizes bigger than 75mm in any direction. It shall have pH value ranging between 6.0 to 8.5.

13.2.4 Oil Cake (Neem/Castor/Groundnut)

The cake shall be free form bush, dust, grit and any other foreign matter.

13.2.5 Sapling of Trees

The sapling of trees shall be of medium height, leafy type and draught resistant variety native to the area and be of good quality of minimum of 2m height or caliper dia of 25mm as directed by the Employer's Engineer.

13.2.6 Sapling of Hedges

The saplings shall be of draught resistant variety normally grown for hedges in the area, approved by the Employer's Engineer.

13.3 Construction Operations

13.3.1 Tree Planting and Refilling Earth after Mixing with Oil Cake, Manure and Watering

Holes of circular shape of 90cm dia and 100cm in depth in ordinary soil shall be excavated and the excavated soil, broken to clods of sizes not exceeding 75mm in any direction, shall be stacked outside the hole. Stones, brickbats, unsuitable earth and other rubbish, all roots, and weeds etc. other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the site as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities required to replace such discarded stuff shall be brought and stacked at site by the MSI, depth not more than 50cm from ground level.

The pit shall be treated for termite by raking the soil up to 50mm and treated with 5% Aldrin or Chloradang dust in soil.

The tree hole shall be manured with powdered Neem/Caster oil cake along with farm yard manure/dump manure screened through 16mm sieve and these shall be uniformly mixed with the excavated top soil after the manure has been broken down to powder (size of particles not to exceed 6mm in any direction) in equal proportion. A 2m high sapling of trees shall be placed at the centre of the hole and then the mixture shall be filled into the hole upto the level of adjoining ground and then profusely watered to enable the soil to subside. The refilled soil shall then be dressed evenly with its surface about 50 to 75mm below the adjoining ground level or as directed by the Employer's Engineer.

The planting shall be completed soon after completion of the median.

13.3.2 Circular Mild Steel Tree Guard with Bars

The tree guard shall be 90cm in diameter.

The tree guards shall be formed of (i) 3 Nos. 25 x 25 x 3mm angle iron verticals 1.95m long excluding splayed outward at lower end up to an extent of 5 cms, (ii) 3 Nos. 25 x 5mm MS flat rings fixed as per design (iii) 15 Nos. 1.55m long 6m dia bars. Each ring shall be in two parts in the ratio of 1:2 and their ends shall be turned in radially for a length of 4cm at which they are bolted together with 8mm dia. and 30mm long MS bolts and nuts.

The vertical iron shall be welded to rings along the circumference with electric plant 15 Nos. bars shall be welded to rings at equal spacing along the circumferences of ring. The lower end of the angle iron verticals shall be splayed outwards up to an extent of 5cm. The lower end of the flat of lower ring shall be at the height of 1.95m. The middle ring shall be in the centre of top and lower ring. The bars shall be welded to the rings as directed by the Employer's Engineer. The entire tree guard shall be given two coats of paint of approved brand and of required shade over a priming coat of ready mixed primer of approved brand. The design of the tree guard shall be approved by the Employer's Engineer.

13.3.3 Planting of Hedges

The hedges saplings shall be planted in two rows, one each along each edge of the median. Bed for the saplings shall be prepared with necessary managing, and the live saplings shall be planted in lines parallel to the median edge to the directions of the Employer's Engineer. Spacing between saplings in a row shall be such that a thick hedge can be grown, and this shall generally be not farther away than 300mm.

The planting shall be completed soon after completion of the medians.

13.3.4 Grassing of Median Area

The included area of the median between the hedges shall be seeded and mulched to develop grass cover in accordance with Clause 308.

13.4 Maintenance

The saplings of trees and hedges planted shall be watered and maintained by the MSI till issue of final taking over certificate. Maintenance shall also include watering, weeding out of undesirable plants and replacement of dead plant, manuring and trimming of the hedges.

Schedule E - Maintenance Requirements

(See Clause 20.43)

1. Maintenance Requirements

1.1 The MSI shall, at all times maintain the Project Components (COC building) in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.

1.2 The MSI 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-fulfillment of the Maintenance obligations by the MSI. Upon occurrence of any breach hereunder, the Client shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 20.43.5 of this Agreement, without prejudice to the rights of the Client under this Agreement, including Termination thereof.

1.3 All materials and works for operations and maintenance of roads and pavements shall conform to the Specifications for Road and Bridge Works (Fifth Revision, April 2013), issued by the Ministry of Road Transport & Highways (MoRT&H) and the relevant IRC publications.

1.4 All materials and works for operations and maintenance of Potable water supply rising mains and distribution networks, Elevated Service Reservoirs (ESR), Recycled water supply rising mains and distribution networks including valves, flow meters etc. shall confirm to CPHEEO Manual on Operation and Maintenance of water supply systems, 2005, MoUD, GOI.

1.5 Where the Standards and Specifications for any of the above work are not given, Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

2. Repair/Rectification of Defects and Deficiencies

The obligations of the MSI in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Appendix E-I of this Schedule-E within the time limit set forth therein.

3. Other Defects and Deficiencies

In respect of any Defect or deficiency not specified in Appendix E-I of this Schedule-E, the Employer's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Standards and Specifications, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the MSI within the time limit specified by the Employer's Engineer.

4. 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 in Schedule M, the MSI shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Employer's Engineer and conveyed to the MSI and the Client with reasons thereof.

5. Emergency Repairs/Restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Components (Administrative and Business Centre) poses a hazard to safety or risk of damage to property, the MSI shall promptly take all reasonable measures for eliminating or minimizing such danger.

6. Daily Inspection by the MSI

The MSI shall, through its engineer, undertake a daily visual inspection of the Project Components (Administrative and Business Centre) and maintain a record thereof in a register to be kept in such form and manner as the Employer's Engineer may specify. Such record shall be kept in safe custody of the MSI and shall be open to inspection by the Client and the Employer's Engineer at any time during office hours.

7. Repairs On Account Of Natural Calamities

All damages occurring to the Project Components (Administrative and Business Centre) on account of a Force Majeure Event or default or neglect of the Client shall be undertaken by the Client at its own cost. The Client may instruct the MSI to undertake the repairs at the rates agreed between the Parties.

Appendix E I – Repair / Rectification of Defects and Deficiencies

(Schedule-E)

The MSI shall repair and rectify the Defects and deficiencies specified in this Appendix E-I of Schedule-E.

1. Architectural, Civil maintenance

1.1 Any break down of door / window / hatch accessories should be replaced / rectified within 24 hours.
1.2 Any breakage of flooring, false ceiling, peeling of paint should be rectified in 48 hours.
1.3 Any damage to External stone cladding, flooring, paving, hardscape, façade etc. shall be rectified within 48 hours.
1.4 Any crack / peeling of Plaster shall be repaired within 48 hrs
1.5 Any water leak in building shall be stopped with 2 hrs and suitable rectification process undertaken.
1.6 Housekeeping services for common utility areas for COC building and connecting street / corridor.

2. Landscape

2.1 Any non-surviving/ unhealthy saplings should be replaced within 48 hours.
2.2 Trees uprooted / damaged should be removed within 8 hours and replaced in one week time.
2.3 Blockages/ leakages / damages in Irrigation System, Water Features Including Filtration System should be made good in 24 hours.
2.4 Any Hardscape / signage damage shall be repaired within 24 hrs.

3. Electrical

3.1 Any Electrical equipment / Apparatus/ cables, etc. shall be restored within two hours in case of minor faults and within eight hours in case of major faults.
3.2 Faulty lighting fixtures should be rectified within six hours.
3.3 Essential spares to be available for immediate repairs.

4. HVAC, Fire Fighting and Plumbing

4.1 Chillers - Minor repair shall be rectified within 24 hrs. and major repair (compressor failure) shall be rectified within 5 days.
4.2 Pumps - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure) shall be rectified within 8 hours.
4.3 Cooling towers - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure) shall be rectified within 8 hours.
4.4 AHU - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure) shall be rectified within 8 hours.
4.5 DX units / VRV units - Minor repair shall be rectified within 4 hrs. and major repair (motor failure) shall be rectified within 24 hours.
4.6 Fans - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure) shall be rectified within 8 hours.
4.7 Piping/valve/ traps/ fittings / Taps leakages - Shall be rectified/replaced within 2 hrs.
4.8 Instruments like gauges/sensors - Shall be rectified / replaced within 2 hrs.
4.9 Any damage to sanitary ceramic fixtures or CP fittings shall be replaced or rectified within 24 hours.
4.10 Essential spares to be available for immediate repair.

5. Fire detection, alarm system, access control and surveillance

5.1 Any damage breakage of any apparatus, equipment, sensors and system in general should not remain nonfunctional for more than two hour.

5.2 Essential spares to be available for immediate repair.

6. Roads and Parking Areas

Nature of Defect or Deficiency		Time Limit For Repair/Rectification
(a)	**Carriageway and Paved Areas**	
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 2000 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Pot holes	24 hours
(iv)	Any cracks in road surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road surface	30 (thirty) days
(vi)	Bleeding/skidding	7 (seven) days
(vii)	Any other defect/distress on the road	15 (fifteen) days
(viii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 hours
(b)	**Earthen Shoulders, Side Slopes, Drains and Culverts**	
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	De-silting of drains	24 hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c)	**Road Side Furniture Including Road Sign and Pavement Marking**	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	48 hours
(ii)	Painting of km stone, railing, parapets, crash barriers	As and when required/Once every year
(iii)	Damaged/missing road signs requiring replacement	7 (seven) days
(iv)	Damage to road mark ups	7 (seven) days
(d)	**Road Lighting**	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(e)	**Trees and Plantation**	
(i)	Obstruction in a minimum head-room of 5	24 hours

Nature of Defect or Deficiency		Time Limit For Repair/Rectification
	m above carriageway or obstruction in visibility of road signs	
(ii)	Removal of fallen trees from carriageway	4 hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(f)	**Other Project Facilities and Approach Roads**	
(i)	Damage in approach roads and pedestrian facilities	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours

7. Sewage Treatment Plant (STP)

7.1 Details for maintenance to be carried out:

7.1.1 The plant should not remain nonfunctional for more than two hours in a month.
7.1.2 Any leakage in pipelines shall be restored within 2 hrs.

8. Solid Waste Management (SWM)

8.1 The bins should not be allowed to overflow at any point of time and should be emptied irrespective of pre-determined frequency of lifting the bins.
8.2 OWC maintenance should be backed by proper plan so that the organic waste does not get accumulated for more than six hours.

Schedule F - Applicable Permits

1. Applicable Permits

- The MSI shall obtain, as required under the Applicable Laws, the following Applicable Permits:
- Permission of the State Government for extraction of boulders from quarry;
- Permission of Pollution Control Board for installation of crushers;
- License for use of explosives;
- Permission of the State Government for drawing water from river/reservoir;
- License from inspector of factories or other competent Authority for setting up batching plant;
- Clearance of Pollution Control Board for setting up batching plant;
- Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
- Permission of Village Panchayats and State Government for borrow earth; and
- Any other permits, clearances or approvals required under Applicable Laws.
- Any other permits, clearances or approvals required under Applicable Laws.
- All other permits required for successful completion of project.

1.1 Applicable permits, as required, relating to environmental protection and conservation shall have been procured by the Client in accordance with the provisions of this Agreement.

2. Architecture

- Commencement Certificate, Intermediate Certificates, Occupancy Certificate and Completion Certificate from local municipal body or designated authority for the buildings.
- Town Planning Department remarks for applicable norms / zones / uses.

3. Civil & Structures

- Water Connection from Public Health Engineering Department (State).
- Provision and permit for connection to proposed municipal sewage collection system at directed location from local municipal body.
- Project Clearance from General Inspectorate for Emergency Situations.
- Project Clearance from the Solid Waste Management Authority.

4. Electrical

- Incoming Power Supply (Main and temporary): State electricity board or power supply authority.
- Substation & Elevators & Solar PV system: CEIG (chief electrical inspector to government) / local statutory authority / PWD
- License to Operate the Elevators from Ministry of Labour or relevant authority.

5. Fire Fighting

- Preliminary approval from Chief Fire Officer prior to construction and final approval on completion of project.

6. FDA Access Control & Security

- Fire Detection & Alarm System - Compliance with IS:2189:1988, BIS: 15908 standards and certification from the Regional Fire Officer / Chief Fire Officer.

7. Roads

- PWD / Municipal clearance for connecting to the existing road.

8. STP

- State Pollution Control Board approval for STP.
- If any hazardous waste is generated from the facility like used DG oil, used batteries etc., the same should be handed over to only SPCB approved agencies for handling hazardous waste.

9. Solid Waste Management

- Permit from the Municipal Corporation for disposal of inert in the land fill site.

Schedule G - Form of Bank Guarantee - Refer Vol 1

Schedule H - Contract Price Weightages

(See Clause 25.11.6)

1. Contract Price Weightages

The Contract Price for this Agreement is Rs (…….).

2. Proportions of the Contract Price

Proportions of the Contract Price for different stages of Construction of the City Operations Centre in Tirupati shall be as specified below.

This price weightages are to be mutually agreed after before signing of agreement.

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
Civil and Structural Work			
Site Grading		**Site Grading up to plinth-2 level**	
	7	Site Grading up to plinth level	22
		Final Site Grading	65
		Compound Wall, Gate, Fencing, Security Cabin	13
Substructure	**10**	**Excavation, earthwork, piling and piling reinforcement, upto plinth**	
		COC Building	70
		Ancillary Structures like OAT, etc	20
		Hardscape, tensile roof, parking covering.	10
		Superstructure (RCC work)	
		COC Bldg Ground and 1st floor	20
Superstructure (RCC work)		COC Bldg 2nd and 3rd, floor	20
	20	COC Bldg 4th and 5th and terrace floor	40

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		Ancillary Structures like OAT, helipad etc	20
Superstructure (Building Work)	**2**	**Masonry and Internal Plaster of buildings**	
		COC full building	100
Superstructure (Building Work)	**1**	**External Plaster, water proofing of buildings, expansion joint**	
		COC full building	100
Superstructure (Ancillary Work)	**1**	**Masonry and complete plaster of Ancillary Structures**	
		Ancillary Structures like OAT, helipad etc	100
Architecture			
Facade, Glazing, windows, louvers, doors and skylights	**8**	**Facade, Glazing, windows, doors and skylights**	
		COC full building	100
Finishing works	**5**	**Finishing works like Flooring, skirting, toilet tiling, plaster works , painting, etc**	
		COC full building	50
		Ancillary Structures like OAT, helipad etc	20
		Entrance Gates, Compound Wall, Fencing and Security Cabins	20

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		Hardscape, tensile roof, parking covering	10
Finishing works	**20**	**Finishing works like false ceiling, painting (int & ext), railing, GRC works,**	
		COC full building	50
		Ancillary Structures like OAT, helipad etc	8
		Entrance Gates, Compound Wall, Fencing and Security Cabins	4
		Hardscape works, tensile roof, parking covering	3
MEP Buildings	**17**		
		COC full building	60
		Site Infrastructure including water, waste water, underground electrical cables, chiller piping etc. and Security Cabin	40
Landscape	**1**		
		Completion of all works related to Softscaping (complete finish)	70
		Completion of all works related to hardscape (complete finish)	30
ICT	**2**	**FDA, Access Control, Security, PA system, BMS, Entry Barriers**	
		COC Full Building	60
		Site Infrastructure and Security Cabin	40
Roads	**3**	**External Roads, Internal Driveways, Pavements, Parking and Storm Water Drains**	100
STP	**1**	**STP and Solid Waste Equipment's and facilities**	100

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
"Data, drawings and analysis of Surveys & Investigations" and "Designs, drawings and reports"	2		100

3. Procedure of Estimating the Value of Work Done

3.1 Civil and Structural Work – Site Grading

Procedure for estimating the value of Site Grading works shall be as follows.

Site Grading Works

Stage for Payment	Percentage weightage	Payment Procedure
Site Grading upto plinth level		
1) Site Grading upto plinth-2 level	22	Payment shall be made on completion of a stage
2) Final Site Grading	65	Payment shall be made on completion of a stage
3) Compound Wall, Gate, Fencing, Security Cabin	13	Payment shall be made on completion of facilities

3.2 Civil and Structural Work – Excavation and Earthworks

Procedure for estimating the value of Excavation and Earthworks works shall be as follows.

Excavation and Earthworks

Stage for Payment	Percentage weightage	Payment Procedure
Excavation, earthwork, piling and piling reinforcement, upto plinth		
1) COC Building	70	Payment shall be made on completion of a stage

2) Ancillary Structures like OAT, helipad etc	20	Payment shall be made on completion of a stage
3) Hardscape, tensile roof, parking covering	10	Payment shall be made on completion of a stage

3.3 Civil and Structural Work – Superstructure (RCC works)

Procedure for estimating the value of Superstructure (RCC works) shall be as follows.

Superstructure (RCC works)

Stage for Payment	Percentage weightage	Payment Procedure
Superstructure (RCC work)		
1) COC Bldg Ground and 1st floor	20	Payment shall be made on completion of a stage
2) COC Bldg 2nd and 3rd floor	20	Payment shall be made on completion of a stage
3) COC Bldg 4th, 5th and terrace floor	40	Payment shall be made on completion of a stage
4) Ancillary Structures like OAT, helipad etc	20	Payment shall be made on completion of a stage

3.4 Civil and Structural Work – Superstructure (Internal Building works)

Procedure for estimating the value of Superstructure (Internal Building works) shall be as follows.

Superstructure (Internal Building works)

Stage for Payment	Percentage weightage	Payment Procedure
Masonry and Internal Plaster of buildings		
COC full building	100	Payment shall be made on completion of a stage

3.5 Civil and Structural Work – Superstructure (External Building works)

Procedure for estimating the value of Superstructure (External Building works) shall be as follows.

Superstructure (External Building works)

Stage for Payment	Percentage weightage	Payment Procedure
External Plaster, water proofing of buildings, expansion joint		
COC full building	100	Payment shall be made on completion of a stage

3.6 Civil and Structural Work – Superstructure (Ancillary Building works)

Procedure for estimating the value of Superstructure (Ancillary works) shall be as follows.

Superstructure (Ancillary Building works)

Stage for Payment	**Percentage weightage**	**Payment Procedure**
Masonry and complete plaster of Ancillary Structures		
Corridors, pergola, , gates, , , OAT, Parking, Helipad	100	Payment shall be made on completion of a stage

3.7 Architecture – Façade, Windows and Doors

Procedure for estimating the value of façade, windows, door and glazing works shall be as follows.

Façade, Windows and Doors

Stage for Payment	Percentage weightage	Payment Procedure
Facade, Glazing, windows, louvers, doors and skylights		
COC full building	100	Payment shall be made on completion of a stage

3.8 Architecture – Finishing works for Flooring and Skirting

Procedure for estimating the value of finishing works for Flooring and Skirting shall be as follows.

Finishing works for Flooring and Skirting

Stage for Payment	**Percentage weightage**	**Payment Procedure**
Finishing works like Flooring, skirting, toilet tiling, dado, plaster		
COC full building	50	Payment shall be made on completion of a stage
Ancillary Structures like OAT, helipad etc	20	Payment shall be made on completion of a stage
Entrance Gates, Compound Wall, Fencing and Security Cabins	20	Payment shall be made on completion of a stage
Hardscape, tensile roof, Covered parking	10	Payment shall be made on completion of a stage

3.9 Architecture – Finishing works for False Ceiling and Painting

Procedure for estimating the value of finishing works for False Ceiling and Painting shall be as follows.

Finishing works for False Ceiling and Painting

Stage for Payment	Percentage weightage	Payment Procedure
Finishing works like false ceiling, painting (int & ext), railing, GRC works, stone cladding		
COC full building	50	Payment shall be made on completion of a stage
Ancillary Structures like OAT, helipad etc	20	Payment shall be made on completion of a stage
Entrance Gates, Compound Wall, Fencing and Security Cabins	20	Payment shall be made on completion of a stage
Hardscape works, tensile roof, covered parking	10	Payment shall be made on completion of a stage

3.10 MEP Works

Procedure for estimating the value of MEP works shall be as follows.

MEP Works

Stage for Payment	Percentage weightage	Payment Procedure
COC full building except ICCC Interior floors	60	Payment shall be made on completion of a stage
Site Infrastructure including water, waste water, underground electrical cables, chiller piping etc. and Security Cabin	40	Payment shall be made on completion of a stage

3.11 Landscape Works

Procedure for estimating the value of Landscape works shall be as follows.

Landscape Works

Stage for Payment	Percentage weightage	Payment Procedure
Completion of all works related to Softscaping (complete finish)	70	Payment shall be made on completion of a stage
Completion of all works related to hardscape (complete finish)	30	Payment shall be made on completion of a stage

3.12 ICT Works

Procedure for estimating the value of ICT works shall be as follows.

ICT Works

Stage for Payment	Percentage weightage	Payment Procedure
FDA, Access Control, Security, PA system, BMS		
COC full building except ICCC Interior floors	60	Payment shall be made on completion of a stage
Site Infrastructure and Security Cabin	40	Payment shall be made on completion of a stage

3.13 Road Works

Procedure for estimating the value of Road works shall be as follows.

Road Works

Stage for Payment	Percentage weightage	Payment Procedure
External Roads, Internal Driveways, Pavements, Parking and Storm Water Drains	100	Payment shall be made on completion of a stage

3.14 STP Works

Procedure for estimating the value of STP works shall be as follows.

STP Works

Stage for Payment	Percentage weightage	Payment Procedure
STP and Solid Waste Equipment's and facilities	100	Payment shall be made on completion of a stage

4. Procedure for estimating the value of Submission and approval of "Data, drawings and analysis of Surveys & Investigations" and "Designs, drawings and reports" works done

"Data, Drawings and analysis of surveys & investigations" and "Designs, Drawings and Reports"

Stage of Payment	Percentage weightage	Payment Procedure	
		% Payment on Complete Submission	% Payment on Approval by Engineer
Data, drawings and analysis of Surveys & Investigations	5%	3%	2%
Designs, drawings and reports of COC Building	30%	20%	10%
Designs, drawings and reports of Utility Infrastructure	5%	3%	2%
Designs, drawings and reports of MEP Services	15%	10%	5%
Designs, drawings and reports of External Ancillary Structure	10%	6%	4%
Designs, drawings and reports of External Roads, Internal Driveways, Pavements, Parking	5%	3%	2%
Designs, drawings and reports of project facilities	10%	6%	4%
Designs, drawings and reports of miscellaneous works	5%	3%	2%
As built drawings	10%	6%	4%
3-D model of all project components	5%	3%	2%

5. Procedure for payment for Maintenance

5.1 The cost for maintenance shall be as stated in Clause 20.43.1.

5.2 Payment for Maintenance shall be made in quarterly installments in accordance with the provisions of Clause 25.11.10.

Schedule I - Drawings

(See Clause 20.36)

1. Drawings

In compliance of the obligations set forth in Clause 20.36 of this Agreement, the MSI shall furnish in AutoCad dwg. format to the Employer's Engineer, free of cost, all Drawings listed in Appendix I-I of this Schedule-I.

2. Additional Drawings

If the Employer's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Appendix I-I, it may by notice require the MSI to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the MSI shall promptly prepare and furnish such drawings to the Employer's Engineer, as if such drawings formed part of Appendix I-I of this Schedule-I.

Appendix I I – List of Drawings

(Schedule-I)

Indicative List of drawings is given in table below;

List of drawings

S. No.	Description	
1	**Site Layout**	
	i	Plot Plan
	ii	Location Plan
	iii	Site Plan with Coordinates, Ground Floor details, Fire Engine Access Provision
	iv	Details for sync up with existing roads, infrastructure
2	**Landscape Drawings**	
	i.	Site Layout with Landscape Plan
	ii.	Site Layout with Planting Plan
	iii.	Site Layout with External Lighting
	iv	Site Layout with Hardscape Plan, Finishes and Details
3	**BUILDINGS (INCLUDING SECURITY CABINS)**	
	Architectural Drawings	
	i	Floor Plans
	ii	Centre Line Plans
	iii	Walling Layout Plans
	iv	Working Drawing Plans
	v	Life safety Plans
	vi	Roof Plans
	vii	Reflected Ceiling Plans
	viii	Floor Area calculation plans
	ix	Flooring Plans for all Floors
	x	Elevations
	xi	Sections
	xii	Wall Sections
	xiii	Staircase Details
	xiv	Railing Details
	xv	Door Window Details

S. No.	Description	
	xvi	Schedule of finishes
	xvii	Stone cladding and finishes samples and swatches
	xviii	Lift Shaft and other shaft Details
	xix	Toilet Layout & Details
	xx	Sanitary Fixtures Schedule
4	**Coordination Drawings**	
	i	Indexing Plans for each Room & Utility
	ii	Floor wise combined layout for each utility
	iii	Coordination layout for each vertical shaft
5	**STRUCTURAL DRAWINGS**	
	i	Pile and Pile cap Layout and Details
	ii	Reinforcement details - Pile and Pile cap
	iii	Structural Plans, Sections, GA details of all Floors
	iv	Reinforcement details of all floors
	v	Layout and reinforcement details of staircase
	vii	Grade slab and Plinth beam details
	ix	All floor beams and lintel beams- reinforcement details
	x	Columns-reinforcement details
	xi	Structural GA details
	xii	Reinforcement details
	xiii	Layout and reinforcement details of OH tank
	xiv	Typical details of cut out, constructions joint, junctions details etc.
		Miscellaneous
6	**External Utility (water supply, sewerage, storm water, electrical & mechanical service structures, etc.)**	
	i	External Utility Structural- Plans, sections
	ii	External Utility Structures reinforcement details
7	**HVAC Drawings**	
	i	All buildings air distribution system layout - all floors
	ii	All buildings chilled water & equipment layout - all floors
	iii	Cooling Load calculations
	iv	P & ID for chilled water and condenser water system
	v	Chiller plant room layout

S. No.	Description	
	vi	HVAC layout - all floors
	viii	Technical data sheets for all equipment / items
8	**Electrical Drawings**	
	i	Singe One Line Diagram (SLD)
	ii	All Buildings Electrical Room GA & Sectional Drawings
	iii	All Buildings Cable Carrier System Layout & Sectional Details for all Floor Plans
	iv	All Buildings Lighting & Small Power Layout for All Floor Plans
	v	All Buildings Earthing & Lighting Protection Layout
	vi	Overall Earthing and Lighting Layout
	vii	Solar PV System drawings
	viii	Electrical Equipment GA, Cable Tray Layouts
		DOCUMENTS:
	viii	Load List
	ix	Power and Control Cable schedule and interconnection schedule
	x	Design calculations of all system and equipment
	xi	Control scheme and data sheets
	xii	All Data-sheets with "By Bidder" details
9	**Plumbing & Drainage Drawings**	
	i	All buildings potable water, flush water, recycled water, drainage & rain water system network and layout - all floors
	ii	Pump room layout
	iii	Technical data sheets for all equipment / items
10	**Fire Protection System**	
	i	All buildings firefighting system including fire hose, fire extinguishers, sprinklers layout - all floors
	ii	Fire Pump room layout
	iii	P & ID for firefighting system layout
	iv	Hydraulic calculation for firefighting system - all floors
	v	Technical data sheets for all equipment / items
11	**Fire Detection & Alarm & Access Control**	
	i	All Buildings Detailed System Description with Block Diagram / Logical Flow Diagram (Hardware & software)
	ii	System Configuration / Design Diagrams (System Architecture Electrical Connectivity, Communication network)

S. No.	Description	
	iii	Mapping of the device locations with the Floor Layouts (AutoCAD Drawings)
	iv	All buildings, fire Detection and Alarm Network and Layout
	Site Infrastructure (Civil, Water Supply, Sewerage, Storm Water, Electrical & Mechanical Service structures, STP, Roads etc.)	
12	**Civil and Structural**	
	i	Bore Hole locations for Proposed COC Building Complex
	ii	Site Contour Plan
	iii	Site Grading Plan and section
	iv	External Utility Structural- Plans, sections
	v	External Utility Structural reinforcement details
	vi	Structural GA details of fire water tank and Pump house
	vii	Reinforcement details of fire water tank and Pump house
13	**External Utilities**	
	i	External Services Network (water supply, sewerage, storm water, electrical, HVAC, recycled water, Data etc.)
	ii	External utilities coordinated site layout
	iii	Overall Road & Landscape Lighting Layout
	iv	External chilled water piping layout
	v	External Fire hydrant layout
	vi	External piping layout
14	**Roads**	
	i	Traffic Circulation Plan
	ii	Site Layout Plan with Surface Finishes on Driveways, Footpath and Parking Areas
	iii	Site Layout Plan with Finished Road Levels and Gradient Details
	iv	Traffic Circulation Plan
	v	Parking Plan & Details
	vi	Typical Cross Section Details of Internal Driveways, Footpath and Parking Areas with Pavement Layers
	vii	Rain Water harvesting, S.T.P. Etc.
	viii	Typical Details of Kerb Stones, Kerb Channels, Manhole Chambers, Manhole Covers Typical Details of Earth Retaining Structures, Embankment Slope, Cut Slope
	ix	Typical Details of Box, Pipe Culverts, Storm Water Drain Structures
	x	Typical Details of Utilities at Road Crossings
	xi	Typical Cross Sectional Details of Roads of xxx m Right of Way with Pavement Layers

S. No.	Description	
	xii	Layout Plan and Longitudinal Profile of Road From CH: xxx to Ch: xxx
	xiii	Working Cross Sections of Road From CH: xxx to CH: xxx at Regular Intervals
	xiv	Typical Details of Street Furniture
15	**Ancillary Structures**	
16	**Architectural**	
	i	Plans
	ii	Sections
	iii	Elevations
	iv	Details, Finishes
17	**Structural Drawings**	
	i	Structural Plans, sections for sub and super structure
	ii	Reinforcement Details
18	**Services (Electrical, Plumbing and Drainage, Storm Water Drainage)**	
	i	Ancillary Structures Services Plans, sections, elevations details
	ii	Ancillary Structures Focus lighting, bollards, signage, cabling and fixture details
	iii	Ancillary Structures Water Supply and Drainage Details

Schedule J - Project Completion Schedule

(See Clause 20.37.2)

1. Project Completion Schedule

During Construction period, the MSI 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 MSI shall notify the Client 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 90th (Ninetith) day from the Appointed Date (the **"Project Milestone-I"**).

2.2 Prior to the occurrence of Project Milestone-I, the MSI shall have commenced construction of the project components and submitted to the Client 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 180th (One hundred and eightieth) day from the Appointed Date (the "Project Milestone-II").

3.2 Prior to the occurrence of Project Milestone-II, the MSI shall have continued with construction of the project components (and submitted to the Client duly and validly prepared Stage Payment Statements for an amount not less than 25% (Twenty Five per cent) of the Contract Price.

4. Project Milestone-III

4.1 Project Milestone-III shall occur on the date falling on the 270th (Two hundred and Seventieth) day from the Appointed Date (the "Project Milestone-III"). This day shall be significant for Interiors of ICCC to begin.

4.2 Prior to the occurrence of Project Milestone-III, the MSI shall have continued with construction of the project components and submitted to the Client duly and validly prepared Stage Payment Statements for an amount not less than 50% (Fifty per cent) of the Contract Price.

5. Project Milestone-IV

5.1 Project Milestone-IV shall occur on the date falling on the 360th (Three Hundred and Sixtieth) day from the Appointed Date (the "Project Milestone-IV")..

5.2 Prior to the occurrence of Project Milestone-IV, the MSI shall have continued with construction of the project components and submitted to the Client duly and validly prepared Stage Payment Statements for an amount not less than 80% (Eighty per cent) of the Contract Price.

6. Project Milestone-V

6.1 Project Milestone-IV shall occur on the date falling on the 450th (Four Hundred and Fifteenth) day from the Appointed Date (the "Project Milestone-V").

6.2 Prior to the occurrence of Project Milestone-V, the MSI shall have continued with construction of the project components and submitted to the Client duly and validly prepared Stage Payment Statements for an amount not less than 90% (Ninety per cent) of the Contract Price.

7. Schedule Completion Date

7.1 The Scheduled Completion Date shall occur on the 540th (Five Hundred and Fortieth) day from the Appointed Date.

7.2 On or before the Scheduled Completion Date, the MSI shall have completed construction in accordance with this Agreement.

8. Extension of time

8.1 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

[See Clause 20.42.1 (II)]

1. Schedule for Tests

1.1 The MSI shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Employer's Engineer and the Client of its intent to subject the project components to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Employer's Engineer and the Client detailed inventory and particulars of all works and equipment forming part of Works.

1.2 The MSI shall notify the Employer's Engineer of its readiness to subject the project components to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Employer's Engineer shall, in consultation with the MSI, determine the date and time for each Test and notify the same to the Client who may designate its representative to witness the Tests. The Employer's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with clause 20.42 and this Schedule-K.

2. Tests

2.1 Architectural & Interior Finishes: Visual and physical check for all Architectural and Interior finishes, including but not limited to flooring, painting, glazing, GRC cladding, Murals, false ceiling, door hardware, cladding & dado, polishes, etc. Operations of doors, windows, louvers shall also be checked.

2.2 Landscape / softscape works: Visual and physical check for softscape works, plants & saplings, lawns, shrubs, irrigation system including sprinklers & drip irrigation, fountains, water circulation and filtration system, etc., including performance verification.

2.3 Civil and Hardscape works: Visual check of construction to determine that all civil, structural and hardscape works conform to the provisions of this Agreement. Physical test if required by the client.

2.4 Entry Gates: Visual and physical check for Automated Entry gate operations including performance verification for sensors, remote and manual controls, etc.

2.5 Electrical: Visual and physical and commissioning test for HT and LT panels, Dry type transformers, UPS, DG set, DC System, busducts, rising mains, distribution boards, power & control cables, SCADA system, elevators, solar PV panels, lighting DB's, switches & sockets, safety features, luminaires / lighting fixtures, street lighting and pole, power supply, grounding, communication between luminaire to control panel and central control system, etc. including performance verification.

2.6 HVAC: Visual and physical and commissioning test for HVAC cooling system, dampers, VAV's, sensors, Ventilation system, drives, control gauges, instrumentations, flow meters, automation, vibration & acoustic insulation, etc including performance verification.

At an appropriate time in consultation with Client / Consultant / Project in Charge the MSI shall demonstrate performance (noise level, power consumption, actual capacity at design conditions etc.) at rated capacity over a period of 6 working days on continuous operating hours. If the tests specified above show that the performance of Air-conditioning & Ventilation system has failed to achieve all the guaranteed parameters or some of them, the MSI shall rectify the defects and carry out modifications if necessary to meet the guaranteed figures and the guarantee tests shall be repeated at no 13extra cost.

2.7 Fire Protection System: Visual and physical and commissioning test for complete firefighting system equipment's, internal & external hydrants, sprinklers, electric & diesel engine pumps, portable fire extinguishers, etc., including performance verification.

2.8 Plumbing & Drainage: Visual and physical and commissioning test for Plumbing & drainage system including water pressure, faucets & valves, sanitary fittings, flush tanks, urinals, faucet & urinal sensors, leakages, etc. including performance verification.

2.9 FDA & Public Address: Visual and physical test for Fire Alarm sensors / detectors, alarms / hooters, Public address system, BMS, etc., including performance verification.

2.10 CCTV, Access Control & Surveillance: Visual and physical test for Security systems including access control card readers and cards, CCTV cameras, monitors, recording and retrieval system, Visitor management system, operating software & hardware, etc., including performance verification.

2.11 Road (Riding quality test): Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be 1800 (Eighteen Hundred) mm for each kilometer.

2.12 Storm Water: Visual and physical test for Rain water drainage system, storm water drains, manholes & manhole covers, rain water harvesting system, etc., including performance verification.

2.13 STP: Visual and physical test for Sewage treatment plant, untreated and treated wastewater quality & quantity for polluting parameters, electrical & mechanical equipment's etc., including performance verification. It should be run successfully for one complete cycle before handing over.

2.14 Other tests: The Employer's Engineer may require the MSI to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the project components with Standards and Specifications.

3. Audits

3.1 Environment Health and Safety Requirements: The Employer's Engineer shall carry out a check to determine conformity of the project components with the environmental requirements set forth in Applicable Laws and Applicable Permits.

3.2 Safety Audit: The Employer's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the project components with the safety requirements and Good Industry Practice.

Schedule L - Provisional Certificate and Completion Certificate

(See Clause 20.42.2 and 20.42.4)

Provisional Certificate

(See Clause 20.42.2)

1. I, …….. (Name of the EMPLOYER's Engineer), acting as EMPLOYER's Engineer, under and in accordance with the Agreement dated …….. (the "Agreement"), for "Design and Construction of City Operations Centre in Tirupati" in the State of Andhra Pradesh through Design Built (DB) Basis Contract through ……. (Name of MSI), hereby certify that the Tests in accordance with clause 20.42 of the Agreement have been undertaken to determine compliance of the Project ..... with the provisions of the Agreement.

2. Construction Works that are incomplete on account of Time Extension have been specified in the Punch List appended hereto, and the MSI 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 ..... or other their safety. The MSI 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 specified in the aforesaid punch list.

3. In view of the foregoing, I am satisfied that that Project ..... can be safely and reliably placed in service of the users thereof, and in terms of the Agreement, the Project ..... is hereby provisionally declared fit for entry into operation on this the …….day of …….20 …..

ACCEPTED, SIGNED, SEALED AND DELIVERED

For and on behalf of
MSI by

EMPLOYER's Engineer by:

(Signature)

SIGNED, SEALED AND DELIVERED

For and on behalf of

(Signature)

COMPLETION CERTIFICATE

(See Clause 20.42.2)

1. I, …….. (Name of the EMPLOYER's Engineer), acting as EMPLOYER's Engineer, under and in accordance with the Agreement dated …….. (the "Agreement"), for "Design and Construction of Design and Construction of City Operations Centre in Tirupati" in the State of Andhra Pradesh under through Design Built (DB) Basis through ……. (Name of MSI), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project ..... with the provisions of the Agreement, and I am satisfied that the Project ..... can be safely and reliably placed in service of the Users thereof..

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Works have been completed, and the Project Works is hereby declared fit for entry into operation on this the ……..day of ……..20 …..

SIGNED, SEALED AND DELIVERED

For and on behalf of

EMPLOYER's Engineer by:

(Signature)

(Name)

(Designation)

(Address)

Schedule M - Payment Reduction for Non-Compliance

(See Clauses 20.43.5., 20.44.2 and 25.11.10)

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 deduction shall continue to be made every month until compliance is done.

1.3 The Employer'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:

Table 1:

Percentage reductions for Architectural and Civil works

Sr. No.	Item/Defect/Deficiency	Percentage
1	**(a) + (b) + (c) (of the applicable monthly maintenance amount)**	**20%**
(a)	**Openings and glazing works (door, window, hatches, skylight, glazing coloured and otherwise etc.)**	**3%**
(i)	Breakage or damage of openable shutters their finishes and accessories like handles, door closers, locks, vinyl, floor springs etc.	2%
(ii)	Repairs of fixed glazing, polycarbonate skylight, louvers, sealants, etc.	1%
(b)	**Flooring, false ceiling, painting**	**7%**
(i)	Defect, breakage, chip off, loosening of flooring	3%
(ii)	Any breakage or damage of false ceiling and peeling or chip off of painting.	4%
(c)	**External stone cladding, flooring, ramps, paving, hardscape, facade**	**10%**
(i)	Damage to facade, external stone cladding and flooring	5%
(ii)	Any breakage, damage to hardscape, ramps, paving	5%

Table 2:

Percentage reductions for Landscape works

Sr. No.	Item/Defect/Deficiency	Percentage
1	**(a) + (b) (of the applicable monthly maintenance amount)**	**10%**
(a)	**Plants, trees and saplings**	**3%**
(i)	Removal and replacement of non-surviving, unhealthy saplings	1%
(ii)	Removal of uprooted or damaged trees, climbers, dried plants	1%
(iii)	Pruning, cutting and maintenance of lawns, shrubs and softscape	1%
(b)	**Irrigation System**	**7%**
(i)	Any blockage or leakage or damage to Drip Irrigation System	2%
(ii)	Any blockage or leakage or damage to Water Sprinkler System	3%
(iii)	Any blockage or leakage or damage to Water Features	2%

Table 3:

Percentage reductions for Electrical works

Sr. No.	Item/Defect/Deficiency	Percentage
1	**(a) + (b) (of the applicable monthly maintenance amount)**	**20%**
(a)	**Electrical Equipment like DG Sets, UPS, Apparatus, Cables**	**5%**
(i)	Faulty, damaged or non-working equipment, apparatus or cable	5%
(b)	**Fixtures**	**5%**
(i)	Faulty, damaged or non-working fixtures	5%
(c)	**Elevators**	**5%**
(i)	Non-functioning of elevators or its accessories	5%
(d)	**Street Lights**	**5%**
(i)	Repair or replacement of fittings, accessories	5%

Table 4:

Percentage reductions for HVAC and Firefighting, Plumbing and Drainage

Sr. No.	Item/Defect/Deficiency	Percentage
1	**(a) + (b) (of the applicable monthly maintenance amount)**	**23%**

Sr. No.	Item/Defect/Deficiency	Percentage
(a)	**HVAC (Chillers, Pumps, Cooling towers, AHUs, DX units, VRV units, Fans)**	**7%**
(i)	Failure of any of the above systems.	3%
(ii)	Leakages / breakages or damage of piping, traps, valves, sensors, gauges	2%
(iii)	Non maintenance of design temperature	2%
(b)	**Water Supply Network (Potable water, Recycled water)**	**4.5%**
(i)	Rising and distribution network repairs,	2.5%
(ii)	valve and flow meters repairs and calibrations, refilling of trenches	2%
(c)	**Sewage collection network**	**4.5%**
(i)	De-silting, overflows in surrounding areas	2%
(ii)	Man holes damages.	2.5%
(d)	**Low side HVAC, firefighting, plumbing and drainage**	**7%**
(i)	Damage or leakage of Piping, traps, fittings, Gauges, sensors	2%
(ii)	Damage to Sprinklers, firefighting equipment's	2%
(iii)	Breakage or leakage of Sanitary Ceramic and CP fixtures	3%

Table 5:

Percentage reductions for Fire Detection, Alarm system, Access Control, Surveillance

Sr. No.	Item/Defect/Deficiency	Percentage
1	**(a) + (b) (of the applicable monthly maintenance amount)**	**7%**
(a)	**Apparatus, equipment, sensors, cameras**	**7%**
(i)	Non-functioning of any of above	7%

Table 6:

Percentage reductions for Roads and Storm Water Drain works

Sr. No.	Item	Percentage
1	**(a) + (b) + (c) (of the applicable monthly maintenance amount)**	**15%**
(a)	**Road works (Carriageway/Pavement, Road, Embankment, Parking, Cuttings, Shoulders etc.)**	**6%**
(i)	Potholes, cracks, other surface defects	3%
(ii)	Repairs of Edges, Rutting	0.5%

Sr. No.	Item	Percentage
(iii)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	1%
(iv)	Deficient slopes, rain cuts, disturbed pitching, vegetation growth, pruning of trees	0.5%
(v)	Damage, coming off of tiles in parking, lack of soil in grass pavers etc	1%
(b)	**Other Road works (Road Furniture, Miscellaneous Items)**	**6%**
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5th km stones	1%
(ii)	Removal of dead animals, broken down/accidental vehicles, fallen trees, road blockades or malfunctioning of mobile crane	1%
(iii)	Maintenance of Multi-purpose corridors, drainage and protective works	3%
(iv)	Defects in Other Project Facilities	1%
(c)	**Storm Water Drain works (of the applicable monthly maintenance amount)**	**3%**
(i)	De-silting, Manhole cleaning, overflows in surrounding areas	1.5%
(ii)	De-silting at outfall, outfall maintenance & hygiene conditions	1.5%

Table 7:

Percentage reductions for STP and SWM

Sr. No.	Item	Percentage
1	**STP and SWM**	**5%**
(i)	Not meeting the effluent parameters	2%
(ii)	Replacement of damaged bins	1%
(iii)	Default on bin lifting frequency	2%

2.2 The amount to be deducted from monthly lump-sum payment for non-compliance of particular item mentioned in Table-1 to 7 shall be calculated on a pro-rata basis for each of the above items as under:

R = P/100 * M *L1/L

Where
P= Percentage of particular item/non- compliance /Defect /deficiency for deduction. For example in Architecture and Civil works, if a broken flooring/tile is not repaired/replaced within 48 hours, the percentage of non-compliance item P is 3%.
M= Monthly lump-sum payment for maintenance in accordance with the Contract Agreement.
A1= Non-complying area (sqm) of the particular Item.
A= Total area (sqm) of the particular Item.
R= Reduction (the amount to be deducted for noncompliance 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 noncompliance.

For any Defect in a part of 10 sqm, the non-conforming area shall be taken as minimum 10 sqm.

Schedule N - Selection of Employer's Engineer

(See Clause 55.1)

1. Selection of EMPLOYER'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 EMPLOYER's Engineer.

1.2 In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the Client 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 EMPLOYER's Engineer (the "TOR") shall substantially conform with Annex 1 to this Schedule N.

3. Appointment of Government entity as EMPLOYER's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Client may in its discretion appoint a government-owned entity as the EMPLOYER'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 Client shall not be eligible for appointment as EMPLOYER's Engineer.

Annexure I – Terms of Reference for Employer's Engineer

(Schedule - N)

Terms of Reference for Employer's Engineer

1. Scope

1.1 These Terms of Reference (the "TOR") for the EMPLOYER's Engineer are being specified pursuant to the EPC Agreement dated ..... (the "Agreement), which has been entered into between the …….Name of Client (the "CLIENT") and ..... (the "MSI") for "Design and Construction of Design and Construction of City Operations Centre in Tirupati" (DB) 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 design, construction and maintenance of the Project Roads and Services

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 2, 3 and 4 of the Agreement shall apply, mutatis mutandis, to this TOR.

3. General

3.1 The EMPLOYER'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 EMPLOYER'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 Client before determining:

a. any Time extension;
b. any additional cost to be paid by the Client to the MSI;
c. the Termination Payment; or
d. 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 EMPLOYER's Engineer shall submit regular periodic reports, at least once every month, to the Client in respect of its duties and functions under this Agreement. Such reports shall be submitted by the EMPLOYER's Engineer within 10 (ten) days of the beginning of every month.

3.4 The EMPLOYER's Engineer shall inform the MSI 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 Client's prior approval in accordance with the provisions of Clause 55.2.

3.5 The EMPLOYER's Engineer shall aid and advise the Client 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 EMPLOYER'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 EMPLOYER's Engineer shall review the Reports, Designs and Drawings furnished by the MSI 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 EMPLOYER's Engineer shall complete such review and send its observations to the Client and the MSI within 15 (fifteen) days of receipt of such Reports, Designs and Drawings; provided, however that in case of a Structure, the aforesaid period of 15 (fifteen) days may be extended up to 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 EMPLOYER's Engineer shall review any revised Reports, Designs and Drawings sent to it by the MSI and furnish its comments within 10 (ten) days of receiving such Reports, Designs and Drawings.

4.3 The EMPLOYER's Engineer shall review the (a) Quality Assurance Plan (b) Health, Safety and Environmental Management Plan submitted by the MSI and shall convey its comments to the MSI within a period of 21 (twenty-one) days stating the modifications, if any, required thereto. The Employer's Engineer shall ensure the MSI's Project Management requirements, regularly on a monthly basis to the Client.

4.4 The EMPLOYER's Engineer shall complete the review of the methodology proposed to be adopted by the MSI for executing the Works, and convey its comments to the MSI within a period of 10 (ten) days from the date of receipt of the proposed methodology from the MSI.

4.5 The EMPLOYER's Engineer shall review the monthly progress report furnished by the MSI and send its comments thereon to the Client and the MSI within 7 (seven) days of receipt of such report.

4.6 The EMPLOYER's Engineer shall inspect the Construction Works and the Project Roads and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the MSI in respect of Defects or deficiencies. In particular, the EMPLOYER's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.

4.7 The EMPLOYER'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 EMPLOYER's Engineer may require.

4.8 For determining that the Works conform to Specifications and Standards, the EMPLOYER's Engineer shall require the MSI to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4.9, the tests specified in the relevant Codes or any modification/substitution thereof and standards for shall be deemed tests conforming to Good Industry Practice for quality assurance.

4.9 The EMPLOYER'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 MSI.

4.10 The timing of tests referred to in Paragraph 4.9, and the criteria for acceptance/ rejection of their results shall be determined by the EMPLOYER's Engineer in accordance with the Quality Control Manuals and/or the relevant Codes and Standards… 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 MSI for its own quality assurance in accordance with Good Industry Practice.

4.11 In the event that results of any tests conducted under Clause 20.41.10 establish any Defects or deficiencies in the Works, the EMPLOYER's Engineer shall require the MSI to carry out remedial measures.

4.12 The EMPLOYER's Engineer may instruct the MSI to execute any work which is urgently required for the safety of the Project Works, whether because of an accident, unforeseeable event or otherwise; provided that incase of any work required on account of a Force Majeure Event, the provisions of Clause 36.3 shall apply.

4.13 In the event that the MSI fails to achieve any of the Project Milestones, the EMPLOYER's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the EMPLOYER's Engineer shall determine that completion of the Project Works is not feasible within the time specified in the Agreement, it shall require the MSI to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the MSI, the EMPLOYER's Engineer shall review the same and send its comments to the Client and the MSI forthwith.

4.14 The EMPLOYER's Engineer shall obtain from the MSI two copies of all the MSI's quality control records and documents before the Completion Certificate is issued pursuant to Clause 20.42.4.

4.15 EMPLOYER's Engineer may recommend to the Client suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the MSI has carried out remedial measure, the EMPLOYER's Engineer shall inspect such remedial measures forthwith and make a report to the Client recommending whether or not the suspension hereunder may be revoked.

4.16 In the event that the MSI carries out any remedial measures to secure the safety of suspended works and Users, and requires the EMPLOYER's Engineer to inspect such works, the EMPLOYER's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Client forthwith, recommending whether or not such suspension may be revoked by the Client.

4.17 The EMPLOYER'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 EMPLOYER's Engineer shall act under and in accordance with the provisions of Clause 20.42 and Schedule-K.

5. Maintenance Period

5.1 The EMPLOYER's Engineer shall aid and advise the MSI in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the MSI.

5.2 The EMPLOYER'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 Client and the MSI.

5.3 The EMPLOYER's Engineer shall specify the tests, if any, that the MSI shall carry out, or cause to be carried out, for the purpose of determining that the Project Works 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 MSI in this behalf.

5.4 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule-E, the EMPLOYER'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.

The EMPLOYER's Engineer shall examine the request of the MSI for closure of any lane(s)/utilities lines of the Project Roads and/or Services 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 MSI. Upon expiry of the permitted period of closure, the EMPLOYER's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the MSI to the CLIENT.

6. Determination of costs and time

6.1 The EMPLOYER's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.

6.2 The EMPLOYER's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.

6.3 The EMPLOYER's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause 55.5.

7. Payments

7.1 The EMPLOYER's Engineer shall withhold payments for the affected works for which the MSI fails to revise and resubmit the Drawings to the EMPLOYER's Engineer in accordance with the provisions of Clause 20.36.2 (IV).

7.2 EMPLOYER's Engineer shall -

a) within 10 (ten) days of receipt of the Stage Payment Statement from the MSI pursuant to Clause 25.11.7, determine the amount due to the MSI and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 25.11.7, deliver to the Client and the MSI an Interim Payment Certificate certifying the amount due and payable to the MSI, after adjustments in accordance with the provisions of Clause 25.11.13.

7.3 The EMPLOYER’s Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the MSI pursuant to Clause 25.11.9, verify the MSI’s monthly statement and certify the amount to be paid to the MSI in accordance with the provisions of the Agreement.

7.4 The EMPLOYER’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 25.11.19.

8. Other duties and functions

The EMPLOYER’s Engineer shall perform all other duties and functions as specified in the Agreement.

9. Miscellaneous

9.1 A copy of all communications, comments, instructions, Drawings or Documents sent by the EMPLOYER's Engineer to the MSI pursuant to this TOR, and a copy of all the test results with comments of the EMPLOYER's Engineer thereon, shall be furnished by the EMPLOYER's Engineer to the Client forthwith.

9.2 The EMPLOYER'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 60 (sixty) days of the Project Completion Date, the EMPLOYER'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 Client, reflecting the Project ..... as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Works and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Client against receipt thereof.

9.4 The EMPLOYER's Engineer, if called upon by the Client or the MSI or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

9.5 The EMPLOYER's Engineer shall inform the Client and the MSI of any event of MSI's Default within one week of its occurrence.

9.6 The Employer’s Engineer, if called upon by the Client, shall attend the meetings on Project reviews, discussions to be held at Client office with required reports and presentations.

Schedule O - Forms of Payment Statements

[See Clauses 25.11.8 (I), 25.11.9 (I), and 25.11.11 (I)]

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

- The estimated amount for the Works executed in accordance with Clause 25.11.6 subsequent to the last claim;
- Amounts reflecting adjustments in price for the aforesaid claim;
- The estimated amount of each Change of Scope Order executed subsequent to the last claim;
- Total of (a), (b), and (c) above;
- Deductions:

  Any amount to be deducted in accordance with the provisions of the Agreement except taxes;
  Any amount towards deduction of taxes; and
  Total of (i) and (ii) above.

- Net claim: (d) – (e) (iii);
- The amounts received by the MSI up to the last claim:
  - For the Works executed (excluding Change of Scope orders);
  - For Change of Scope Orders, and
  - Any deductions
  - Taxes deducted

2. Monthly Maintenance Payment Statement

- The monthly Statement for Maintenance Payment shall state:
- the monthly payment admissible in accordance with the provisions of the agreement;
- the deductions for maintenance work not done;
- net payment for maintenance due, (a) minus (b);
- amounts reflecting adjustments in price under Clause 25.11.15; and
- amount towards deduction of taxes

3. MSI's claim for Damages

Note: The MSI shall submit its claims in a form acceptable to the Client.

Schedule P: Insurances – Refer Vol 3

Schedule Q – Deleted

Schedule R - Guideline for Health, Safety and Environment Plan

(See Clause 20.31.5 (l))

The MSI shall prepare and submit a project specific Health, Safety and Environment plan based on the Manual for Construction Procedures within 30 days of the Appointed Date

Schedule S - Project Management Requirements

(See Clause 20.31.5 (m))

The MSI shall perform all the Project Management activities necessary for proper planning, management and control of the work. Below are the project management requirements which MSIs needs to comply at different stage of the projects:

1. Participate in the project kick-off workshop with project stakeholders designated by Client. The kick-off workshop shall accomplish the following objectives:

- Common understanding of the project goals and objectives
- Define respective roles and responsibilities and
- Agree on the methods of communication and reporting throughout the project duration.

2. Participate in monthly project status review meetings and present the project progress update in the meeting. The frequency of project status review meetings may change based on actual requirements.

3. Schedule: The MSI shall submit a Level 3 schedule that cover's the full scope of MSI's work within 30 calendar days of date of appointment. This will be reviewed within 15 calendar days by Client. The MSI shall incorporate the comments and resubmit the schedule no later than 15 calendar days after receiving the comments from Client. Upon approval the level 3 schedule will become the baseline schedule for all the future monitoring and tracking.

The MSI should keep to the following guidelines

i. Develop and incorporate a detailed Work Breakdown Structure (WBS) for all project schedules that are submitted.

ii. All schedules shall be created, maintained and submitted to Client in the latest version of MS Project or equivalent in an electronic format.

iii. All schedules shall follow the Critical Path Method (CPM) of scheduling and shall have meaningful and realistic logical ties and relationships between activities.

iv. The use of negative lags is not permitted in the baseline and all other versions of the schedule.

v. The schedule must contain all the long lead procurement items identified.

vi. Shall exercise reasonableness while assigning constraints in schedule and milestones

vii. Upon approval, the copy of the Baseline schedule will become the first Current Schedule.

viii. The Current schedule shall be actively updated and maintained by the MSI every month.

ix. The updated MS Project or equivalent schedule file should be submitted every month along with Monthly progress report in electronic format. A pdf copy of the updated schedule with all activities also needs to be submitted

x. A schedule narrative document shall accompany the updated electronic schedule describing the work performed in the reporting period.

xi. The MSI should also submit a level 4 schedule within 60 calendar days from approval of baseline level 3 schedules.

xii. In the level 4 schedule activity durations should be reasonable (typically no more than 15 days duration except for project management tasks, procurement activities for long lead items or any other activity that obviously needs to be of longer duration).

4. Cash Flow: Prepare project cash flow at the start of the project. Prepare monthly statements to show the actual versus plan spending; update the cost periodically

5. Lessons Learned Database: The MSI shall develop and actively maintain a "lessons learned" database on a monthly basis (to be included in the monthly project report) and submit it to Client at the end of the project during closeout.

6. Risk Register: Maintain an active risk register addressing the risks and mitigation measures (could be in excel format) that lists the project risks related to their Scope of Work.

7. Inter-Project Links: Identify potential inter-project links, inter-dependencies or conflicts/interference to work or work areas and narrate them in the monthly progress report.

8. Monthly Progress Report: Prepare and submit a monthly progress report (standard format and template will be provided by Client at a later date). Items 3 to 7 mentioned above shall be the minimum information that will need to be included in the monthly progress report.

9. For better collaboration, MSI shall use the Programme and Document Management system that will be provided by Client at a later date and pay for the cost of procuring licenses to use the system.

10. Monthly payments are subject to timely submission of monthly progress report and the monthly updated electronic schedule file in the required and acceptable format.