

**Design, Build and Commissioning of 7 MLD
Common Effluent Treatment Plant (CETP) and
0.5 MLD Package Sewage Treatment Plant (STP)
at DPIA on EPC basis with 4 years Operation and
Maintenance - Package B**

VOLUME 2

PART 4 PARTICULAR CIVIL SPECIFICATION

July 2026



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1. CIVIL WORKS

The scope of work under this contract shall, in general, include (but not limited to) the design and construction of all relevant Civil & Structural Works, viz. Foundation, Superstructure for all Civil Units, Technology and Non Technology buildings, cable tray supports, access, Operating platforms on grade/structure/equipment, Cable trenches, Surface preparation, Painting of Civil/Structural/Buildings, all drainage works etc. including supply of all materials, tools & tackles, labour, etc. in as per the Specifications, Standards included in the RFQ cum RFP Document.

The scope for Civil works will be in accordance with Volume 2, Part 1 [General requirements], Volume 2, Part 2 [Process Specifications] and Volume 5 Indicative Tender Drawings, including the following units as a minimum, but not restricted to the same:

1.1 Process/Technology Works

1.1.1 CETP Works

1. Receiving chamber
2. Coarse Screen Channel
3. Wet well
4. Inlet chamber
5. Fine screen chamber
6. Distribution chamber for Vortex Grit chamber
7. Vortex Grit Chamber
8. Outlet channel for Vortex grit chamber
9. Equalisation basin
10. Equalisation basin outlet sump
11. Distribution chamber for Flash mixing tank
12. Flash Mixing tank
13. Flocculation tank
14. Outlet chamber for flocculation tank
15. Distribution chamber for clarifier
16. Primary Clarifier
17. Combined Sludge Sump
18. Thickener feed pump house
19. Distribution chamber for ultra-fine screen
20. Ultra-Fine screen chamber
21. Outlet chamber for ultrafine screen
22. Distribution Chamber for Pre-Anoxic tank

23. Pre-Anoxic tank
 24. Aeration tank
 25. Post-Anoxic tank
 26. Outlet chamber to Aeration tank
 27. MBR Tank
 28. Permeate pump house
 29. MBR back pulse tank
 30. Blower Building
 31. RAS Sump
 32. Distribution chamber for CCT
 33. Chlorine mixing tank
 34. Chlorine Contact Tank (CCT)
 35. CCT Outlet chamber
 36. Sludge Thickener
 37. Thickened Sludge Storage Tank
 38. Thickened sludge pump house
 39. Dewatering building (First Floor)
 40. Plant return sump
 41. OCU Area
 42. Chemical Building (G+1)
 43. Admin Building (G+1 Building) with SCADA/PLC room on the first floor
 44. Storage room
- 1.1.2 STP Works
1. Receiving chamber
 2. Coarse Screen Channel
 3. Wet well
 4. Inlet chamber
 5. Foundation/Base for the Package STP
- 1.2 Non-Process/Non-Technology Building**
1. Guard Room.
 2. Drinking water tank.
 3. Maintenance Building and Store
 4. Admin and Control building, including Laboratory

1.3 Ancillary Works

1. Overhead Tank
2. Outdoor 11 KV Transformers and DG House.
3. Roads and Pathways.
4. Compound Wall and Gates.
5. Internal S.W. Drains, Water Supply and Internal Sewerage Network.
6. Site Grading and Levelling.
7. Embankment along the canal (nallah).
8. Fire Water Sump (if any)

Other items required to make the system complete shall be deemed to be included by the Bidder irrespective of the fact whether it has been specifically mentioned/specified above, and the Bidder shall supply/construct/provide the same if called upon to do so during detailed engineering or if so, required by AITL.

Major Civil Structural activities involved shall include, but not be limited to the following:

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- a) RCC & Steel/Aluminium work in foundation for various types of Structures, pipe supports, platforms, buildings, staircases, etc., including associated earthwork, backfilling, disposal of earth within in plant complex, PCC, cantering, shuttering at different stages of concreting, providing insert plates and anchor bolts, pockets, sleeves, etc.
- b) RCC work in superstructure for making blind floor platform, etc., including associated cantering, shuttering at different stages of concreting, etc.
- c) Supply Fabrication & Erection of Aluminium/FRP/Structural steel works at all heights for supporting chamber / Tanks/buildings, access platforms, operating platforms, ladders, steel stairs, etc. It includes surface preparation and primer as per the standard specification.
- d) Supplying and applying field primer and finish paint conforming to environmental requirements to all concrete/steel/aluminium structures
- e) Supplying and providing handrails on platforms and staircases, etc.
- f) Taking necessary statutory approvals from appropriate agencies before carrying out any activity, if required
- g) Architectural design and drawings for buildings, including Administration and Control Building accommodating laboratory, Chemical Building, Maintenance Building, MCC and Blower House, Guard Room, Store etc., as outlined below.

Any other item not specifically mentioned, but required to complete the work as per specifications, drawings, and directions of the Engineer-in-Charge.

1.4 Process/Technology Buildings for STP and CETP

1.4.1 Receiving Chamber

The Receiving Chamber shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the receiving chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided.

2 coats of epoxy paint or acrylic paint over epoxy primer, over 2 coats of an approved brand of wall putty shall be applied from outside the Structure for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.2 Coarse Screen Chamber

The Coarse Screen Chamber shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the Structure for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.3 Wet Well

The Wet well shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. A hand railing of 50 mm

diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the structure for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. Support structure for the EOT crane shall be provided as per design. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.4 Inlet Chamber

The Inlet Chamber shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.5 Fine Screen Chamber

The Fine Screen Chamber shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/ chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality waterproof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the

building for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.6 Vortex Grit Chamber

The Vortex Grit Chamber shall be constructed in a minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. FRP Grating cover shall be designed to sustain a live load of 2.4 KN/m² for pedestrian traffic.

1.4.7 Anoxic Tank

The Anoxic Tank shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of the tank shall be protected by an epoxy resin coating except where a GRP liner is provided. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. Support structure for the lifting arrangement shall be provided.

1.4.8 Aeration Tank

The aeration tank shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming

to IS: 456. The access platform shall be a minimum of 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of the tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated footrest of approved type shall be provided inside the chamber for maintenance. An access platform for operation and maintenance of diffusers, including a lifting arrangement, if required, and a pipe support arrangement, shall be provided.

1.4.9 MBR

The MBR shall be constructed in minimum M35 grade concrete with sulphate-resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be a minimum of 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirements. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water-proof compound in requisite proportion. The internal faces of the Chamber shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by the Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance. Support structure for a suitable lifting arrangement shall be provided.

1.4.10 Blower Room

The Blower Room shall be constructed in a minimum M25 grade concrete, conforming to IS: 456. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit. The top surface, inside and outside faces and floor of the room shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of the blower room shall be painted by acrylic emulsion paint in three coats with primer as per the manufacturer's instructions. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of an approved brand of wall putty shall be applied from outside and inside the building for a pleasant aesthetic appearance as approved by the Engineer in charge. Soundproofing

shall be done if required so as to keep the sound decibels within permissible limits. The raft shall be designed as a machine foundation. Vibration analysis is to be carried out so as to avoid resonance or any other problems arising from pump vibrations. Space for the movement of vehicles shall be provided for blower maintenance. Support structure for EOT shall be provided as required. Cable trenches shall be provided for laying of cables as per design. Firefighting shall be provided with sufficient number of points as per design. Brickwork shall be done as per design.

1.4.11 Pump Room

The Pump Room shall be constructed in minimum M25 grade concrete, conforming to IS: 456. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit. The top surface, inside and outside faces and floor of the room shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of pump room shall be painted by acrylic emulsion paint in three coats with primer as per manufacturer's instruction. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside and inside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Sound proofing shall be done if required so as to keep the sound decibels within permissible limits. Raft shall be designed as machine foundation. Vibration analysis is to be carried so as avoid resonance or any other problems arising from pump vibrations. Space for movement of vehicles shall be provided for blower maintenance. Support structure for EOT/hoist shall be provided as required. Cable trenches shall be provided for laying of cables as per design. Firefighting shall be provided with sufficient number of points as per design. Suitable support structures shall be provided for HVAC requirement. Brickwork shall be done as per design.

1.4.12 RAS Sump

The RAS Sump shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of Chamber shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance. Support structure for Gantry Crane shall be provided.

1.4.13 Back Pulse Tank

The Back Pulse Tank shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per the latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of tank/ chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance.

1.4.14 MCC Room

The MCC Room shall be constructed in minimum M25 grade concrete, conforming to IS: 456. Brick Masonry shall be provided as per design. RCC staircase 900 mm wide shall be provided for access from ground level to the top of the unit. The top surface, inside and outside faces and floor of the room shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside and inside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Raft shall be designed as machine foundation. Cable trenches shall be provided for laying of cables as per design. Firefighting shall be provided with sufficient no of points as per design. Brickwork shall be done as per design.

Raised flooring as per Electrical requirements of cable trench and specification to be provided. False Ceiling as per HVAC requirements and specification to be provided. Roof height is to be provided keeping into account Electrical requirement of clearance over panel.

1.4.15 Activated Carbon Filter Building

The Activated Carbon Filter Building shall be constructed in minimum M25 grade concrete, conforming to IS: 456. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit. The top surface, inside and outside faces and floor of the room shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside and inside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Raft shall be designed as machine foundation. Cable trenches shall be provided for laying of cables as per design. Firefighting shall be provided

with sufficient no of points as per design. Brickwork shall be done as per design.

1.4.16 Chlorine Mixing Tank/Chlorine Contact Tank

The Chlorine mixing tank and chlorine contact tank with baffle arrangement as per process requirement shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the Tank/Chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber/tank for maintenance. Vibration analysis for Chlorine Mixing tank due to the agitator has to be done.

1.4.17 STP Treated Effluent Tank

The STP Treated Effluent Tank shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. This tank should be designed as a closed water tank with suitable vent as per process requirement with RCC slab at the top. Top slab should be provided with adequate access opening with cover for tank maintenance. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the Tank/Chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase.

1.4.18 Sludge Thickener

The Gravity Sludge Thickener with adequate bottom slope as per process requirement shall be constructed in minimum M35 grade concrete with sulphate resistant cement as

per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide with hand railing. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. The top surface, inside and outside faces and floor of the Tank/Chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase.

In case Gravity Belt Thickener is considered for Sludge thickening then it should be enclosed in a Sludge Thickening Building with adequate arrangement for sludge removal as per process requirement.

The sludge thickener building shall be constructed in minimum M25 grade concrete. The columns, roof slab and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. RCC staircase 1200 mm wide shall be provided for access from ground level to the roof of the building. 2 coats of epoxy paint or acrylic paint over epoxy primer shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along staircase. Brickwork shall be done as per design.

1.4.19 Thickened Sludge Storage Tank

The Thickened Sludge Storage Tank shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform required if any and foundation for the tank shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit. The inside and outside faces, floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the tank for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance.

1.4.20 Dewatering Building

The Dewatering building shall be constructed in double storeyed in minimum M25 grade concrete as per latest IS 456/3370. The columns, and foundation for the building shall be

of RCC with minimum M25 grade concrete, conforming to IS: 456... RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the building. The top surface, inside and outside faces and floor of the building shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of building shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along staircase. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. Space at ground floor shall be provided for movement of vehicles to collect sludge from hopper chute. Brickwork shall be done as per design.

1.4.21 Chemical Building

The Chemical Building shall be constructed in minimum M25 grade concrete as per latest IS 456/3370. The columns, access platform and foundation supporting the building shall be of RCC with minimum M25 grade concrete, conforming to IS: 456 if not in contact with sewage or related processes. The building shall be 2 storey high as per design. The access platform shall be of minimum 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the building. Steel Ladder shall be provided for accessing chemical dosing tank agitators and for chemical preparation. The top surface, inside and outside faces and floor of the building shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of building shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. Adequate structural arrangement shall be made for provision of EOT crane. Brickwork shall be done as per design.

1.4.22 Plant Return Sump

The Plant Return Sump shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. PVC encapsulated foot rest of approved type shall be provided inside the sump for maintenance. Sump shall be provided with suitable lifting arrangement.

1.4.23 Grit Classifier/Storage Area/ Odour Control Unit

Grade slab shall be provided in RCC of minimum M25 grade, conforming to IS: 456.

1.4.24 CETP Equalization Tank and pump sump

The Equalization Tank and pump sump shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The access platform and foundation supporting the tank shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of sump shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the tank for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance. Suitable lifting arrangement shall be provided for mixers and pumps.

1.4.25 CETP Post Anoxic Tank

The Post Anoxic tank shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the tank/chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber for maintenance. Access platform for operation and maintenance of diffusers including lifting arrangement, if required and pipe support arrangement shall be provided.

1.4.26 CETP Flash Mixing and Flocculation Tank

The Flash Mixing and Flocculation Tank shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from

ground level to the top of the unit & to the operating platforms. The top surface, inside and outside faces and floor of the Tank/Chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of tank shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the tank for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the chamber/tank for maintenance. Vibration analysis due to the agitator has to be done.

1.4.27 CETP Combined Sludge Sump

The Combined Sludge Sump shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The access platform and foundation supporting the sump shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide. Hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. RCC staircase 1200 mm wide shall be provided for access from ground level to the top of the unit. The top surface, inside and outside faces and floor of the sump shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of sump shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the sump for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase. PVC Encapsulated foot rest of approved type shall be provided inside the sump for maintenance.

1.4.28 CETP Primary Clarifier

The Primary Clarifier with adequate bottom slope as per process requirement shall be constructed in minimum M35 grade concrete with sulphate resistant cement as per latest IS 3370. The columns, access platform and foundation supporting the chamber shall be of RCC with minimum M25 grade concrete, conforming to IS: 456. The access platform shall be of minimum 1200 wide with hand railing. A hand railing of 50 mm diameter stainless steel pipe 1.0 m high shall be provided as per safety requirement. The top surface, inside and outside faces and floor of the Tank/Chamber shall be finished smooth with cement mortar 1:3, 20 mm thick, mixed with approved quality water proof compound in requisite proportion. The internal faces of Chambers shall be protected by an epoxy resin coating except where a GRP liner is provided. 2 coats of epoxy paint or acrylic paint over epoxy primer over 2 coats of approved brand of wall putty shall be applied from outside the building for a pleasant aesthetic appearance as approved by Engineer in charge. Buffed stainless steel grade 304 handrail (three rails viz. top, bottom and middle) fixed to steel balustrades to be provided along access platforms and staircase.

1.5 Non Process/Non Technology Building

General:-

- i. All building works shall be of reinforced concrete framework with concrete floors and roofs. All external walls shall be in 230 mm thick brick masonry built in cement mortar (1:5).
All internal partition walls except for toilets shall be in 230 mm thick brick masonry built in cement mortar 1:4. Toilet partition walls shall be in 115 mm thick brick masonry built in cement mortar 1:3
- ii. The Location of building shall be fixed by the Bidder as per his technological requirement so as to achieve economy of design and system requirement.
- iii. The Admin & Control Building shall be a double storied RCC Framed Structure in Brick Masonry Work (with inside and outside plastered and painted to suit with the local area architecture)
- iv. The minimum clear height for ground floor shall be as per bye laws.
- v. The Building shall be designed as per the bye laws keeping in view all sorts of safety measures.
- vi. The Building should include Record Room for storage of files/papers/log books etc.
- vii. RCC roof and acid/fire resistant vitrified tiles shall be provided in laboratory with overhead water tank.
- viii. The material shall be M25 grade concrete frame with Brick masonry infills
- ix. Bidder to provide staircase to reach roof. Width of each flight is 1.2m doglegged.
- x. Electrical fittings, plumbing and bathroom fittings shall be in bidder's scope.
- xi. Painting to be done inside and outside. Plastic paint to be applied inside and water proof paint to be applied outside.
- xii. Fire safety equipment shall be provided in this building.
- xiii. Toilets shall be provided in the building.
- xiv. Toilet areas, walls and ceilings, shall have one coat of primer and two coats of plastic emulsion paint.
- xv. The finished floor level in toilet areas shall be 25 mm below general finished floor level elsewhere in the building.
- xvi. Sewer line to be connected to nearest STP manhole.
- xvii. Drinking water supply and its storage for the people in the building to be provided.
- xviii. Complete plumbing work including but not limited to firefighting, supply of water for washrooms, pantry and other utilities as per design to be provided.
- xix. All buildings shall have reinforced concrete roofs which shall be made waterproof by application of an approved roof polythene / bitumen membrane. The finished roof surface shall have adequate slope to drain quickly the rain water to R.W down take inlet points.
- xx. For roofing drainage, C. I. rainwater down takes with C.I. bell mouth and MS grating at top shall be provided. For roof areas up to 40 sq. m minimum two nos. 100 mm diameter down take pipes shall be provided. For every additional area of 40 sq. m or part thereof, at least one no. 100 mm

- dia. down take pipe shall be provided.
- xxi. Top surfaces of chajjas and canopies shall be made waterproof by providing a screed layer of adequate slope or application of an approved roof membrane and sloped to drain the rain water.
 - xxii. Building plinth shall be minimum 500 mm above finished ground level around building.
 - xxiii. All doors, windows, rolling shutters shall have lintels above. Chajja protection to lintels on external walls shall be such as to prevent the rain water splashing into the building. The minimum width of chajjas for doors, windows and rolling shutters shall be 750 mm, 600 mm & 900 mm respectively.
 - xxiv. Wherever equipment and machinery are to be moved for inspection, servicing, replacement etc., suitable movable EOT of minimum capacity of 5 tonnes or more as required shall be provided with monorail and operating equipment.
 - xxv. The design of buildings shall reflect the climatic conditions existing on site. Process buildings shall as far as is possible permit the entry of natural light. Use of glazed panelling shall be kept to a minimum and preference shall be given to wall openings protected by weather canopies.
 - xxvi. Emergency exit doorways shall be provided from all buildings in order to comply with local and international regulations. Stairways and paved areas shall be provided at the exit points.
 - xxvii. The Laboratory and Chlorine house shall be provided with a sink with two drinking water taps of 20 mm size with adequate inlet and outlet connections.
 - xxviii. The side walls of buildings shall, except those used for storage and handling of Chlorine gas comprise at least 15% ventilated brickwork or louvres. Ventilated brickwork or louvres shall not be used where the ingress of driven rain could affect plant or stored materials. Flat roofed areas shall be provided with roof vents to further encourage a through flow of air.
 - xxix. All walkways, staircases, platforms etc. shall be minimum 1200 mm wide and will be provided with hand railing on one or both sides.
 - xxx. The floor shall generally be made of 150 mm thick concrete slab on grade with 230 mm thick rubble soling and polyethylene sheet. The grade slab shall be provided with Tor 10 mm reinforcement Bars at 200 mm c/c both ways.
 - xxxi. All hardware fittings and fixtures for doors, windows and louvers (e.g. Hinges, bolts, locks, latches, stay doorstops, door closers, floor springs) shall be heavy type matching to the size and weight of the door/window/ventilator shutters. These shall operate easily without hindrance secure properly without jamming, require nominal maintenance durable under prevailing site/weather conditions.
 - xxxii. Suitable steps and/or ramp with overhead RCC Canopy shall be provided as per requirement, at the entrances of the buildings.
 - xxxiii. Plastered surfaces of exterior faces of building shall be thoroughly cleaned of dust by sand papering and scrubbing. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry.

1.5.1 Administrative Cum Control Building including Laboratory for STP/CETP

The Building shall be of adequate size for total 10 MLD capacities STP and 12 MLD capacities CETP as required with following features:

The Administrative Building shall be single/double storeyed structure with a minimum total built up area of 400 sq. m and a floor height of 4.5 m. The Admin Block shall comprise of offices for employees, Laboratory, Plant Manager Room, conference room, record room, Control Room, Rack room, Pantry and toilets for staff. 1-day water storage for appointed staff calculated as per NBCC guidelines for water requirements has to be provided on top of the building in form of RCC or PE tank.

It shall be emphasized that the administrative building at STP/CETP site shall be based on the concept of green building, so that maximum utilization of natural resources can be done. The building shall be designed in such a way that ample natural light is available and dependence on generated power is minimized during daytime. Similarly, ventilation shall also be taken care off. It shall also be ensured that the administrative block be surrounded by thick shrubs to avoid any odour issues within the building premises. The material required for construction shall be based on green building concept. A rainwater harvesting structure especially for Administrative building is also proposed. Green Building concept material such as hollow concrete blocks, brickwork with clay fly ash bricks, laminated veneer lumber frame doors and windows, heat resistant tiles on roofing, Acid resistant tiles as per relevant IS shall be used for Laboratory and glazed ceramic tiles for toilets etc. shall be used. Control room shall have false flooring and False Ceiling as per HVAC requirements.

The proposed building shall meet the following minimum carpet requirements.

S. No.	Description	Min Area requirement	Remarks
1.	Office for employees	80 sq. m	1 unit
2	Record Room	15 sq. m	1 unit
3.	Laboratory	80 sq. m	1 unit
4.	Plant Manager Room	25 sq. m	2 units
5.	Control room (operator)	40 sq. m	1 unit
6.	Rack room	80 sq. m	1 unit
7.	Conference room	40 sq. m	1 unit
8.	Pantry	4 sq. m	1 unit
9.	Male Toilet	6 sq. m	2 unit
10.	Female Toilet	6 sq. m	2 unit

The offices of the Employees shall have one independent single leaf wooden flush door of BIS approved make 750 mm wide x 2100 mm high and 1200 mm high glazed windows with Sal wood frame covering at least 20 % of the of floor area. Aluminium partitions with glass panels shall be provided for the staff in office section as required. The Conference Room shall have 2 (two) independent double leaf wooden flush doors of BIS approved make 1000 mm wide x 2100 mm high and 1200 mm high glazed windows with Sal wood frame covering at least 20% of the floor area. The flooring of the office including conference room shall be in vitrified tiles of approved make/ pattern. There shall be 2

(two) toilets (1 for Gents and 1 for Ladies) of 6m² area each with appropriate plumbing work connecting to the nearest sewer.

1.5.2 Laboratory

The laboratory shall be accommodated in the administrative building for a minimum 72 m² of floor area. There shall be independent single leaf wooden flush door of BIS approved make 750 mm wide x 2100 mm high and 1200 mm high glazed windows with Sal wood frame covering at least 20% of the of floor area. In the laboratory, there shall be 75 mm thick RCC work platform of 1 m width, at a height of 1.0 m from floor level on three sides of the internal walls of the laboratory. Laboratory sinks of 375 mm x 450 mm (ID) shall be fitted on the work platform. Further, there shall be 400 mm wide x 750 mm high open shelves with a horizontal partition in between made of 50 mm thick precast RCC slab resting over 125 mm thick brick work all along the work platform abutting the wall. The work platform and the open shelves shall be covered with white glazed ceramic tiles of approved quality. The entire floor area and the walls up to 2 m height shall be covered with fire and acid resistant vitrified tiles of approved make/pattern of approved quality.

The laboratory shall be provided with appropriate plumbing work so that the laboratory wastes are suitably disposed of by connecting to the nearest sewer. The lab also have a separate store for chemicals, consumable which are required for all necessary test for analysis of sewage. The inside wall shall be provided with two coats of oil bound distemper of approved quality of colour over a coat of primer for the outside walls two coats of waterproof cement paint of approved quality and colour shall be provided. The flooring shall be in acid resistant vitrified tiles and the make, quality and colour shall be got approved by the Engineer in Charge. All steel surfaces are to be painted with approved anticorrosive paint.

1.6 Ancillary Works

1.6.1 Roads and Pathways

- h) Suitable Internal Roads & Pathways shall be provided inside the plant as required for approach to all Units, and as per the Layout shall be prepared and submitted by the successful Bidder and duly approved by the Employer/ PMC/Engineer-in-Charge.
- i) Standard drawings for bitumen roads as per the recommendations of IRC for class A loading should be used.
- j) All Internal Roads shall be laid inside the plot boundary of STP/CETP and shall be designed for easy movements of transport vehicles, loading and unloading of materials, equipment's etc. and shall comprise of:
 - i. A Carriage Width of not less than 3.5 m with a 0.75 m elevated berm on each side with precast Kerb Stones on each side for peripheral roads/internal roads.
 - ii. The Road shall have a Drain provided all along the periphery within the plant boundary as required. All the drains within plot area are in the Contractor's scope of work.

1.6.2 Drains

- a) Based on spot levels and data available for natural drainage, one or two minimum disposal points shall be provided at the ultimate boundaries of the plot for disposal of rain/storm water during monsoon.
- b) Storm Water Drain on one/or both sides of Roads with sufficient numbers of CD works shall be provided as per design during detailed engineering.
- c) The Drain shall also be provided all along the periphery i.e. Compound Wall within the plot boundary for effective disposal of rain/storm water.
- d) The hydraulic section of Drain shall be designed according to the norms given further. RCC/PCC drains shall be adopted.
- e) The Covers of Drain shall be preferably prefabricated heavy duty RCC Covers. Suitable arrangement for water entry from roads shall be provided.
- f) The Layout and Cross Section Drawings shall be approved by Employer/ PMC/Engineer-in-charge.
- g) The crossings of Roads by Drain shall be designed for vehicular traffic.
- h) Suitable Sewage drain shall be provided to connect the sewage from different units to main line.

1.6.3 Site Grading and Levelling

- a) The area earmarked shall comprise of all the Treatment Units.
- b) Site grading shall be done to achieve the levels mentioned in the design drawings.
- c) No extra claim shall be made on basis of excavation of different types of soil/rock.
- d) The Bidder shall inspect the site and use the above mentioned drawing for final made up reclamation levels at the corners of the plot using existing levels.
- e) The Bidder shall make good the entire plot area after completion of Work.

1.6.4 Other Items

Any other item which is required to make the system complete shall be deemed to be included by the Bidder irrespective of the fact whether it has been specifically mentioned/ specified above and the Bidder shall supply/ construct/ provide the same if called upon to do during detail engineering or if so required by Employer/ PMC/Engineer-in-Charge.

1.6.5 Embankment works

The embankment is to be provided to prevent the seepage of water from the canal (nallah) into the plot. RCC retaining wall shall be provided for the same. The minimum grade of concrete will be M25 grade concrete. All measures necessary to protect the plot from seepage of water from canal shall be under embankment works. The depth of foundation of the retaining wall shall be kept below scour depth. The water stops shall be provided at locations where joints in concrete are proposed. The fencing works shall be

done above this retaining wall so as to achieve the desired level of fence. The height of wall shall be above the HFL in canal considering a return period of 100 years.

1.6.6 Fencing Works

The fencing shall be done all along the boundary of the plot so as to safeguard the equipment's inside the plot. The height of the fencing shall be from 3m to 5m or as per direction of the Engineer in Charge. The fence wall shall be preferably precast RCC fence wall where precast panels are placed between the posts. Also barbed wire approved by Engineer in charge shall be placed on the fence wall for protection. The depth of post shall be at least 500mm inside the ground. The ground shall be prepared where the precast panel touches the ground. The first precast panel shall be 200mm below ground level. At least 100mm thick blinding concrete shall be placed where the panel touches the ground. This fencing wall shall also be placed above the embankment wall so to reach the envisaged level of fence wall.

2. DESIGN NORMS

- 2.1.1 The minimum design life of all Structures and Buildings shall be 50 years.
- 2.1.2 All the structural designs submitted by successful Bidder are subject to approval from Employer's Engineer/PMC/Engineer-in-Charge for scrutiny/proof checking. Any modification/correction suggested in design calculations as well as drawings during scrutiny will have to be incorporated without any extra cost and this is a mandatory condition.
- 2.1.3 Any dewatering required for Work, both incidental and continuous is deemed to be included in the lump sum quoted offer for all stages of Work. Nothing will be paid separately for dewatering of any kind and on any account.
- 2.1.4 Bidders shall assess and include all auxiliary, ancillary and incidental works required and include all the costs for the same in his offer.
- 2.1.5 All water retaining structures shall be water tight and shall be protected from flooding. The total structure shall be designed for uplift and shall have factor of safety at least 1.25 as per IS 3370:.
- 2.1.6 The uplift may be resisted by dead weight of concrete. Alternatively it can be resisted using 50% dead weight and 50% rock anchor as per design requirements.
- 2.1.7 Stability analysis shall be performed on all structures.
- 2.1.8 Base pressure of the structures shall be within permissible limits for normal conditions. No tension shall be allowed in base slab/footing under normal condition. Tension of 20% of SBC of soil shall be allowed during emergency condition.
- 2.1.9 Soil in foundation and plinth filling or filling shall be compacted / consolidated or given any suitable treatment so as not to undergo volume changes due to consolidation or proximity of ground water or surface water.

- 2.1.10 The proposed site is situated at a place where reclamation has been carried out. Care shall be taken to avoid differential settlement.
- 2.1.11 Cold joints in concrete if exists or proposed shall be properly cleaned and painted with epoxy or synthetic bonding coat before further concreting. Water bars shall be provided at these locations so as to avoid water seepage.
- 2.1.12 While designing the Terrace Slab, load of 11.5 cm thick (average) Standard Indian Water Proofing treatment with IPS Finish, shall be considered.
- 2.1.13 Water proofing shall be done for all roof slabs.
- 2.1.14 All the concrete to be used for structural components of Sewage Treatment Plant is controlled concrete of grade M35 using sulphate resisting cement with 'extreme' exposure conditions. The concrete shall preferably be ready mix with plasticizers manufactured as per mix design as per Bid specifications and the cement content is not less than 400 Kg/cum with sulphate resistant cement. The maximum water cement ratio is 0.45 and standard deviation as per IS 456-2000 for designing the mix design is as per IS 456-2000 (latest versions). Only river sand shall be used in concrete. However, if contractor desires to use crushed sand, a prior approval from Employer's Engineer/ Engineer in charge shall be obtained.
- 2.1.15 The aggregates for RCC/PCC are of maximum nominal size 20 mm graded aggregates.
- 2.1.16 The plain cement concrete or bedding concrete shall be controlled M20 concrete with cement content not less than 250 Kg/Cum.
- 2.1.17 The exposure condition for building frame structure shall be considered very severe.
- 2.1.18 Box type water proofing treatment shall be provided to the structures below ground level. In case of wet well, if rock anchors are provided, Box type water proofing treatment shall not be required.
- 2.1.19 The use of pozzolanas like fly ash etc. is permitted for its use in the concrete subject to maximum percentage of 20%. The pozzolanas shall confirm to relevant IS code and shall not pose any problem to structural elements due to subsoil, soil and weather conditions in short term as well long term considerations. Other admixtures, if to be used, shall be got approved from the Engineer before starting the Work. Use of Slag Cement/Pozzolanas Cement/Fly ash, Blended Cement with fly ash confirming to latest IS code recommended for the entire structure shall be got approved from Employer/ PMC/Engineer-in-charge prior to its use in concrete for mix design and regular use. The recommendation of use of cement other than OPC shall be based on valid reasons and findings in laboratory especially the chlorides and sulphate contents in soil and water of construction site. The Bidder shall carry out the test of subsoil water and soil samples for determination of Sulphates.
- 2.1.20 Geotechnical Report and Borehole location plant has been attached as Annexure-1. The borehole data provided is indicative. Before quoting for offer, the Bidder shall assess and design foundation system and arrangement on their own independently. Bidder must submit the offer on the basis of the worst soil condition of the two.

It is the responsibility of bidder to carry out site study and soil investigation at his own cost to verify the data provided in Annexure-1 [Geotechnical Report and Borehole location plan] prior to bidding and detailed design.

- 2.1.21 The cost on behalf of these geological explorations is deemed to be included in the offer and no extra cost will be admissible. Further, in any case no extra claim will be entertained by Employer/ PMC towards variation in soil conditions and its affect over the civil prices quoted by the Bidder.
- 2.1.22 Foundations Conditions: The footing/foundations/piling arrangements shall rest on firm strata and shall be used for designing purpose. The foundation shall be so engineered that short term and long term settlement (including differential settlement between adjoining columns / walls) is within permissible limits as per stipulations of IS: 1904-1986 and IS: 456-2000 (Latest Revision). In case of pile foundation, only precast prebored piles shall be used.
- 2.1.23 The Contractor shall be responsible for safe load carrying capacity of each pile and/or group of piles and shall guarantee his workmanship and materials against any damage resulting therefore to the building superstructure erected on pile foundations.
- 2.1.24 The socketing criteria in the hard rock shall be as specified by Geotechnical Consultant or recommended in the structural drawings, whichever is higher and in line with the energy requirement.
- 2.1.25 The excavation in the hard strata / hard rock is to be done by controlled blasting or mechanical means, and the design bed level shall be made good with minimum M20 concrete.
- 2.1.26 The binding wire for reinforcement steel shall be specifically G.I. 16 SWG.
- 2.1.27 The thickness of the concrete shall be with cover to the reinforcement as per IS: 9077-1979, specifically for resistance of corrosion.
- 2.1.28 Adequate precaution shall be taken to avoid temperature or differential movement cracks for structural and non-structural elements by providing expansion joints at suitable locations. Necessary arrangement shall be made to prevent water seepage through expansion joints. Joints between masonry or concrete and door / windows shall be caulked with synthetic putty. Also the joints between two non-conventional concrete shall be made watertight by special treatment and use of water bars.
- 2.1.29 The underground portion of all Units shall be painted with 2 coats of coal tar epoxy paint from outside.
- 2.1.30 The total internal surface of water and sewage containers, walkways, steps, slabs, soffits shall be painted with 2 coats of epoxy paint or acrylic paint over epoxy primer for protection of concrete surface.
- 2.1.31 The formwork used shall be of good quality preferably steel formwork should be used. The thickness of formwork shall be such that it can firmly bear the weight of concrete during construction without sagging.

- 2.1.32 The maximum pour height of concrete should not be greater than 1.2m.
- 2.1.33 The maximum pour thickness of concrete in one lift of concreting should be between 1.2m to 1.5m.
- 2.1.34 Honey combing of the structure shall be avoided by proper use of needle vibrators. If honey combing is found, then the structural section shall be suitably replaced/treated with epoxy concrete as per directions of Engineer in Charge. Bleeding of concrete if encountered then direction of Engineer in Charge should be followed.
- 2.1.35 The contractor shall use the ground water table from the soil investigation report/ground water table report. In case the ground water table report is not available the structure shall be designed for ground water table till ground level.
- 2.1.36 Joints
- a) Movement joints such as expansion joints, complete Contraction joints, partial Contraction joints and sliding joints shall be designed to suit the requirements. However, Contraction joints shall be provided at specified locations spaced not more than 7.5 m in both directions right angle to each other for walls and rafts.
 - b) Suitable gaps at the location of expansion joints at suitable interval of not more than 30 m shall be provided in walls, floors and roof slab of all structures. However, no expansion joints shall be allowed for water retaining structures.
 - c) Construction joints shall be provided at right angles to the general direction of the member. The locations of construction joints shall be decided as per convenience of construction. To avoid segregation of concrete in walls, horizontal construction joints are normally to be provided using Tongue and Groove arrangement.
 - d) Expansion joints for non-liquid retaining structures shall be provided as per IS 3414.
- 2.1.37 Partly / Fully Underground Liquid Retaining Structures Basis for Design
- e) All underground or partly underground liquid containing structures shall be designed as per the provisions of IS: 456-2000 and IS: 3370 – 2021 (Part I & II) for the following conditions:
 - f) Structures directly in contact with Sewage and effluent shall have allowable crack width 0.1 mm considering Tightness Class-3 of IS 3370-Part-2.
 - g) Liquid depth up to full height of wall (including free board): no relief due to lateral soil pressure from outside to be considered.
 - h) Reservoir empty (i.e. no liquid or any material inside the storage area): full lateral earth pressure at rest/action due to surrounding soil and surcharge pressure as applicable shall be considered.
 - i) Partition wall if any between dry sump and wet sump and or sumps / container to be designed for full liquid depth up to full height of wall.
 - j) Partition Wall between two compartments to be designed as one compartment

empty and other full.

- k) Structures shall be designed for safety against uplift in empty conditions considering the depth of the water table where applicable as per the soil investigation report.
- l) Walls shall be designed under operating conditions to resist forces developed due to mobilization of earth and dynamic water loads.
- m) Underground or partially underground structures shall also be checked against stresses developed due to any combination of full and empty compartments with appropriate ground/uplift pressures on the base slab. A minimum factor of safety of 1.2 shall be ensured against uplift or floatation.

The nominal cover to meet durability conditions to reinforcement for various structural elements (foundation, column, wall, beam, slab etc. shall be as per IS: 456.

- n) Platform for all the liquid retaining structure shall have chequered precast cement concrete tiles.

3. CONCRETE AND REINFORCEMENT SPECIFICATIONS

3.1.1 Reinforced Concrete for Structural components

- a) Non water retaining Structure: As per IS 456: 2000 (or other relevant codes with latest revisions).
- b) All structures in contact with sewage and effluent shall be M35 grade. All structures not in direct contact with sewage and effluent should be in M25 grade.
- c) All concrete works in contact with sewage or effluent shall be in sulphate resistant cement.

3.1.2 Plain Cement Concrete shall be of M20 Grade.

3.1.3 Ready Mix Concrete is preferable for all RCC works. The mix design for the same shall be approved by PMC/Engineer-in-charge. The contractor should preferably have own RMC batching plant or else he should get approval from PMC/Engineer-in-charge for the agency from whom RMC is procured.

3.1.4 Structures in contact with sewage or effluent shall be under 'extreme' exposure conditions. Structures not in direct contact with sewage or effluent will be under "very severe" exposure conditions. The Structural Components shall be designed as per IS: 3370 & IS: 456-2000 and other relevant Codes with latest revisions.

3.1.5 The minimum Cement Content in Concrete shall be as per Cl 5.2.5 of Standard Civil spec. / latest relevant IS code (whichever higher) for all concrete work as per the specified concrete grade.

3.1.6 All Reinforcing Steel shall be TMT Fe 500 Grade of Thermax or Tempcore from approved Manufacturers viz. TISCO, SAIL, RINL, or as per the approved vendor list. Confirming to IS 1786 (latest Revision).

- 3.1.7 The Ready Mix Concrete shall be as per IS: 4926-2003 and IS: 456-2000 for all its requirements like ingredients, mix design, manufacturing, placing, compaction, curing, testing etc.
- 3.1.8 The Contractor has to give Destructive/Non-destructive Testing and Permeability tests wherever required and the frequency as under relevant applicable IS Code.
- 3.1.9 Required structural arrangements in the form of reinforcement dowels duly encased in concrete to avoid corrosion shall be provided to connect the existing structure with the structure to be constructed in future.
- a) All pipes and conduits laid below the structural plinth and road works shall be embedded in concrete of grade M-20 having minimum 150 mm thick concrete cover all around.
 - b) All buildings and process units shall have minimum 1.0 m wide, 100 mm thick plinth protection paving in M20 grade concrete. All plinth protection shall be supported on well-compacted stratum and hand packed rubble soling 230 mm thick minimum.
 - c) Approved quality waterproofing compound (chloride free) shall be added during concreting of all liquid retaining structures, in the proportion specified by the Manufacturer.
 - d) For walls and base slabs of liquid retaining structures, the following shall be considered.
 - e) The minimum thickness of all RCC works for various structural members/elements shall be as follows irrespective of design thickness:

i)	Walls for liquid retaining structures	250 mm
ii)	Roof slabs for liquid retaining structures	200 mm
iii)	Bottom slabs for liquid retaining structures	200 mm
iv)	Floor slabs including roof slabs, walkways, canopy slabs	150mm
v)	Walls of cables/pipe trenches, underground pits etc	175mm
vi)	Column footings	300 mm
vii)	Parapets, Chajjas	100 mm
viii)	Precast trench covers	100 mm
ix)	Pile caps	500 mm
x)	Beam width	230 mm
xi)	Beam Depth	300 mm
xii)	Dome at Edge	250 mm

xiii)	Dome	200 mm
xiv)	Launder (Base Slab & wall)	150 mm
xv)	Wall Foundation (At Junction of base slab and wall) for liquid retaining structure	300 mm

4. BRICKWORK & FINISHING WORKS

- a) All external walls shall be in 230 mm thick first class brick masonry built in cement mortar in (1:5).
- b) All internal partition walls shall be in 115 mm thick brick masonry built in cement mortar (1:4).
- c) Two 8 mm dia. MS bar in every fourth course laid horizontally.
- d) All external masonry surfaces shall be plastered in two coats with sand faced cement plaster in cement mortar (1:4) & shall have a total thickness of 23 mm. Waterproofing compound of approved make and quality shall be added to the cement mortar in proportions specified by the Manufacturer only with use of PVC chicken mesh wherever applicable.
- e) All internal masonry surfaces shall be finished with 12 mm thick cement plaster in cement mortar (1:4) with plaster of Paris (POP). The walls shall be finished with painting and the type of painting shall be in accordance with the specifications as specified.
- f) RCC stairways shall be provided to permit access between different levels within buildings. All roof tops and tops of overhead tanks shall be made accessible with the staircases. Vertical ladders in stainless steel fitted with landing point extensions will be permitted where considered appropriate by the EMPLOYER/ PMC's representative to access areas not frequently visited. Steel ladders are to be provided for access to chemical dosing tanks, if any.
- g) Plinth shall be minimum 600 mm above finished ground level around building.
- h) All floor cut outs and cable ducts, etc. shall be covered with pre-cast concrete covers in outdoor areas and Stainless Steel 304 chequered plates of adequate thickness in indoor areas.
- i) All Handrailing shall be made up of Stainless Steel 304 with three rails viz (Top, Bottom and middle rail) around all process/Non Process units.

5. LOADS AND LOADS COMBINATIONS

- 5.1.1 All buildings and structures shall be designed to resist the worst combination of the following loads / stresses under test and working conditions which include dead load, live

load, wind load, seismic load, stress due to temperature changes, shrinkage and creep in materials, dynamic loads. Load combinations for Liquid retaining structure shall be as per IS 3370 apart from following conditions specified in Clause 2.1.39.

- a) Preliminary load combinations
- b) Normal conditions
 - i. Construction condition- all construction complete
 - ii. Operation condition- Plant running
- c) Emergency conditions
 - i. Construction conditions+ other loads+ Earthquake
 - ii. Construction conditions+ other loads+ wind load
 - iii. Operation conditions+ other loads+ Earthquake
 - iv. Operation conditions+ other loads+ wind load
- d) FOS in sliding = 1.5,
- e) FOS in overturning = 1.5,
- f) Partial safety factors as per IS 456:2000 to be used in design.
- g) Deflection check shall be performed for serviceability conditions as per provisions of IS 456:2000.

5.1.2 Dead Load

This shall comprise of loads arising due to all permanent construction including walls, floors, roofs, partitions, stairways, fixed service equipment and other items of machinery. In estimating the loads of process equipment all fixtures and attached piping shall be included.

The following minimum loads shall be considered in design of structures:

- a) Weight of water: 9.81 kN/m³
- b) Weight of soil: 20.00 kN/m³ (irrespective of strata available at site and type of soil used for filling etc.) However, for checking stability against uplift, actual weight of soil as determined by field test shall be considered.
 - a. weight for concrete 24.00 kN/m³
 - b. weight of reinforced concrete 25.00 kN/m³
 - c. weight of brickwork (exclusive of plaster) 22.00 kN/m³
 - d. weight of plaster to masonry surface 18.00 kN/m³ (minimum)
 - e. weight of granolithic terrazzo finish or rendering 24.00 kN/m³
 - f. weight of sand (filter media) 18.00 kN/m³

5.1.4 Live Load

Live loads shall be in general as per IS: 875. However, the following minimum loads shall be considered in the design of structures:

- | | | |
|-------|--|---------------------------|
| (i) | Live loads on roofs | : 5.00 kN/m ² |
| (ii) | Live loads on floors supporting
equipment such as pumps,
blowers, compressors, valves etc. | : 10.00 kN/m ² |
| (iii) | Live load on all other floors
Walkways, stairways and platforms | : 5.00 kN/m ² |

In the absence of any suitable provisions for live load in I.S. Codes or as given for any particular type of floor or structure, assumptions made must receive the approval of the Employer/ PMC's representative/Engineer-in-charge prior to starting of the design work.

Apart from the specified live loads or any other load due to storage of materials, any other equipment load or possible overloading during maintenance or erection/construction in part or full, most critical condition shall be considered in the design.

5.1.5 Wind load

Wind Loads in general shall be as per IS: 875 (Part 3): 1987. However, the following parameters shall be considered for calculation.

- | | | |
|---------------------------------------|---|---|
| Basic Wind Speed | = | 39 m/s |
| Probability Factor, k ₁ | = | Refer Clause 5.3.1, IS: 875 (Part 3) - 1987 |
| Topography factor, k ₃ | = | Refer Clause 5.3.3, IS: 875 (Part 3) - 1987 |
| Terrain , height factork ₂ | = | Refer Clause 5.3.2, IS: 875 (Part 3) – 1987 |

5.1.6 Seismic Load

5.1.7 Dynamic Load

Dynamic loads due to working of plant items such as pumps, blowers, compressors, centrifuges, reduction gears, traveling cranes, etc. shall be considered in the design of structures. Structures should also be checked so that no resonance occurs.

6. DESIGN STANDARDS

- All design shall be based on the latest Indian Standard Specifications or Codes of Practice published 28 days prior to the last date of submission of Bid. The design standards adopted shall follow the best / modern engineering practice in the field based on any other international standard or specialist literature subject to such standard reference or extract of such literature in the English language being supplied to and approved by the Employer/ PMC's representative/Engineer-in-charge. In case of any variation or contradiction between the provisions of the Indian Standards or Codes and the specifications given along with the submitted Bid document, the provision given in this Specification shall be followed.
- All reinforced concrete structural design shall generally conform to the recommendations made in the following latest publications of the Indian Standards Institution:

S. No.	Description	Reference
1	Code of Practice for Plain and reinforced concrete	IS: 456 – 2000
2	Code of Practice for design loads for buildings and structures (Part I to IV).	IS 875
3	Code of Practice for concrete structures for the storage of liquids Part I & II : (2021)	IS: 3370 (Part I & II 2021(with latest amendments)
4	Criteria for earthquake resistant design of structures	IS: 1893: (Part 1:2016 & IS 1893-part-2-2014)
5	Code of Practice for design and construction of machine foundations (Part I to IV)	IS: 2974
6	Standard Specification and Code of Practice for road bridges Loads and Stresses	IRC: 6 Part II
8	Code of Practice for general construction in steel	IS: 800: 2007
9	Code of Practice for use of steel tubes in general building construction	IS: 806
10	Code of Practice for earthquake resistant design and Construction of Buildings	IS: 4326 – 1993
11	Code of practice for design and construction of foundations in soil: General requirements.	IS: 1904 – 1986
12	Code of practice for design and construction of pile Foundations.	IS: 2911 (Part-I) – 1979, (Part-3) – 1980 & (Part-4) – 1985
13	Code of practice for ductile detailing for reinforced concrete structures subjected to seismic forces.	IS: 13920 – 2016
14	Code of Practice for Design and Construction of ring Foundation	IS: 11089 – 1984
15	Criteria for design for R.C.C. Staging for Overhead water tanks.	IS: 11682 – 1985
16	Recommendations for detailing of reinforcement in reinforced concrete works.	IS: 5525 – 1969
17	Specification for 43-grade Ordinary Portland Cement.	IS: 8112: 1989
18	Specification for 53-grade Ordinary Portland Cement.	IS: 12269 – 1987
19	Specification for mild steel and medium tensile steel bars and Hard drawn wires for concrete reinforcement.	IS: 432 (Part – I) - 1982
	Part-I: Mild steel and medium tensile steel bars.	
20	Specification for high strength deformed steel bars and Hard drawn steel wires for concrete reinforcement.	IS: 1786 – 2008
21	Specifications for Portland Pozzolana Cement	IS: 1489 – 1991
22	Specifications for Concrete Admixtures	IS: 9103 – 1999
23	Code of practice for Ancillary structures in sewerage system	IS: 4111 (Part-4) – 1968

24	Code of practice for corrosion protection of steel reinforcement in RB and RCC construction	IS: 9077 – 1979
25	Code of practice for use of fly ash in concrete	IS: 3812
26	Code of practice for ancillary structures in sewerage system	IS: 4111
27	Handbook on Masonry Design and Construction	SP: 20
28	Handbook on Concrete Reinforcement and Detailing	SP: 34
29	Safety code for scaffolds and ladder (Part 1 & 2)	IS: 3696
30	Safety code for Excavation Work	IS: 3764
31	Safety code for erection of structural steel Work	IS: 7205

6.1.1 Schedule of Finishes

Unit Name	Floor Finish	Doors	Windows	Painting	Roof finish
Raw Sewage Pump House & ASP Air Blower House	40 mm thk IPS (with abrasion resistant additive)	GI Rolling Shutter 16 gauge (see through), mechanically operated	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weathercoat paint	Grading and water proofing
MCC Room	Flooring of antistatic material over 40 mm thk IPS (with abrasion resistant additive) Top:-False/Raised flooring	GI Rolling Shutter 16 gauge (see through)	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weather coat paint	False Ceiling Air Conditioned Grading and water proofing
Rack Room & Control Room	Vitrified / Marbonite flooring with same skirting. The size of Marbonite tiles shall be min 600 mm x 600 mm & thickness min 10 – 12 mm Top:-False/Raised (Computer)flooring	35 mm thk. Solid Core Flush Door with heavy duty brass Hinges, Aldrop, Tower Bolt, Handles, etc. with plastic lamination	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weather coat paint	False Ceiling Air Conditioned Grading and water proofing
Office (Operator's room, Staff room, Pantry, record room etc.)	Vitrified / Marbonite flooring with same skirting. The size of Marbonite tiles shall be min 600 mm x 600 mm & thickness min 10 – 12 mm.	35 mm thk. Solid Core Flush Door with heavy duty brass Hinges, Aldrop, Tower Bolt, Handles, etc.	Sliding Anodized Aluminium (heavy section) Glazed Louvered Window	Internal: Plastic paint External: waterproof weather coat paint	False Ceiling Air Conditioned

Unit Name	Floor Finish	Doors	Windows	Painting	Roof finish
	Top:-False/Raised (Computer)flooring	with plastic lamination			Grading and water proofing
Toilet Block	Antiskid Colour Glazed tiles ceramic (floor/Dado)	Factory moulded FRP/PVC Door as approved by Engineer in charge	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weather coat paint	
Maintenance and Store Room	40 mm thk IPS (with abrasion resistant additive)	35 mm thk Solid Core Flush Door with heavy duty brass Hinges, Aldrop, Tower Bolt, Handles, etc. with plastic lamination.	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weather coat paint	Grading and water proofing
DG House	40 mm thk IPS (with abrasion resistant additive)	GI Rolling Shutter 16 gauge (see through), mechanically operated	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weather coat paint	Grading and water proofing
Dewatering Building	- Antiskid tiling as approved by Engineer in charge & Colour Ceramic - Glazed Tiles Dado		Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weathercoat paint	Grading and water proofing
Staircase	Grey granite with nosing & drain section	One MS safety door with two coats of synthetic enamel paint and one FRP/PVC Door	Sliding Anodized Aluminium (heavy section) Glazed	Internal: Plastic paint External: waterproof weathercoat paint	
Chlorine Contact Tank	Colour glazed tiles ceramic (Floor/Dado) up to full height	---	---	External: Epoxy Paint	

Unit Name	Floor Finish	Doors	Windows	Painting	Roof finish
Aeration and MBR Basins	---	---	---	Internal: epoxy resin coating External: waterproof weather coat paint	

Note:

- The area of units shall be as planned by Bidder and the details of same shall be submitted with Bid.
- All window jambs, sills and soffits shall be with good quality and shade of granite approved by Engineer, properly designed to stop rain water entry in the room.
- All door frames shall be of teakwood. Frame section 2.5" x 6" and teakwood cover moulding shall be provided.
- All window glass shall be 4 mm thick plain glass of approved make (Modi Float / Saint Gobain/Asahi).

6.1.2 Furniture to be Supplied as per building plan and furniture layout approved by Engineer in Charge.

7. DESIGN SUBMISSION

- The Contractor shall submit complete detailed design calculations of each of the components such as foundations and superstructure together with general arrangement drawings, construction drawings and explanatory sketches as required to the Employer / PMC. Separate calculations for foundations or superstructures (Both Soft & Hard copies (Pdf & Excel format)) submitted independent of each other shall be deemed to be incomplete and will not be accepted by the Employer / PMC.
- The design considerations described hereunder establish the minimum basic design requirements of plain and reinforced concrete structures, architectural details, masonry structures and structural steel works. However, any particular structure shall be designed for the satisfactory performance fulfilling the functions for which it is being constructed. The Contractor shall also check the stability of partly completed structures.

7.1.1 General Arrangement of Plant

The following general guidelines shall be considered while preparing the general arrangement of the proposed plant besides the process requirements, as specified in these documents.

- The general arrangements of all the treatment units of STP/CETP, buildings and other structures shall be got approved from the SE (Env.), EMPLOYER/ PMC. Changes if any

suggested will be incorporated in the final layout at no extra cost to EMPLOYER/PMC/Engineer-in-charge.

- b) Suitable passages, lifting eyes or other means shall be provided to permit the removal of equipment that may be required during the course of its normal operational life for maintenance or any other purpose.
- c) Areas where leakage is likely to occur whether under normal use or during maintenance shall be provided with covered drainage channels, which shall direct spilled liquid either to a suitable plant drain or to a sump from where it can be pumped out to external drain in the plant area.

7.1.2 Orientation

- a) The Layout of the proposed plant shall be suitably prepared and to fit it within the space allotted in order to interface conveniently with the existing infrastructure of roadways as well as inlet and outlet Pipe-Work.
- b) Underground services, requiring to be relocated in order to accommodate the proposed site layout, shall be relocated by the Contractor with the approval of the Employer/ PMC's representative/Engineer-in-charge.

7.1.3 Testing of Water Tightness

The Contractor shall carry out a water tightness test for the maximum head condition in liquid retaining structures i.e. with the liquid standing at full supply level. All cost of testing including cost of water shall be borne by the Contractor. This test shall be carried out in accordance with the procedure given below:

- a) For water tightness test, before the filling operations are started, the reservoirs shall be jointly inspected by the EMPLOYER/ PMC's representative/Engineer-in-charge and the representative of the Contractor and condition of surfaces of wall, construction joints etc shall be inspected and noted and it shall be ensured that jointing material filled in the joints is in position and all openings are closed. The Contractor shall make necessary arrangement for ventilation and lighting of reservoir by way of flood lights, circulators etc. for carrying out proper inspection of surfaces and internal conditions if so desired by the EMPLOYER/ PMC's representative/Engineer-in-charge.
- b) The structure should be cleaned and initially filled to the normal maximum level with the specified liquid at a uniform rate of not greater than 2 m in 24 h.. Records of leakages starting at different level of water in the reservoirs, if any, shall be kept.
- c) by the addition of further liquid for a stabilizing period while absorption and autogenous healing take place. The stabilizing period may be 7 days for maximum design crack width of 0.1 mm. After the stabilizing period, the level of the liquid surface shall be recorded at 24 h intervals for a test period of 7 days.. The total drop in surface level over a period of 7 days shall be taken as indication of the water tightness of the reservoir which shall confirm to IS: 3370 (Part 1)-2021. Also there shall be no indication of leakage around the puddle collars or on the wall and bottom of reservoir.
- d) If the structure does not satisfy the test requirements and the daily drop in water

level is decreasing, the period of test may be extended for further seven days and if the specified limit is not exceeded, the structure may be considered as satisfactory.

- e) In case the drop in water level exceed the permissible limit with the stipulated period of test, the Contractor shall carry out such additional works and adopt such measures as may be directed by the EMPLOYER/ PMC's representative/Engineer-in-charge to reduce the leakage to permissible limit. The entire rectification Work that shall be carried out in this connection shall be at Contractor's cost.
- f) If the test results are unsatisfactory, the Contractor shall ascertain the cause and make all necessary repairs and repeat the water tightness test procedures, at his own cost. Should the re-test results still be unsatisfactory after the repairs, the structure will be condemned and the Contractor will dismantle and reconstruct the structure to the original specification, at his own cost.
- g) During testing and during the defect liability period the impression marks created due to seepage shall be rectified and made good by grouting.

7.1.4 Roadways, Pathways and Hard Standings

- a) A comprehensive road network shall be provided around the proposed treatment plant units i.e. main entrance, administrative block and all adjacent buildings, Centrifuge building, grit chambers, digesters, aeration tank and clarifiers etc., to link with the main road and the existing road network to permit vehicular access to each unit of the plant for necessary maintenance, delivery of consumables and personnel access.

Roads shall be designed as per provisions of IRC codes. The proposed roads shall have following crust.

- i. 500 mm compacted subgrade of minimum 95% Proctor Density
- ii. 200 mm granular sub-base (GSB).
- iii. Wet mix macadam in 2 layers of 100 & 75 mm.
- iv. 75 mm bituminous bound macadam (BBM).
- v. 50 mm dense bituminous macadam (DBM).
- vi. 25 mm bituminous concrete (BC/AC).
- vii. The use of sand drains or removal of marshy soil shall be ascertained by the bidder before proceeding for sub-grade.
- b) Paved pedestrian access ways shall be constructed to provide a network of logical routes interlinking all plant areas. Damage to any existing roads on account of their use by the Contractor shall be made good to the satisfaction of the Employer/ PMC's representative/Engineer-in-charge.

- c) Hard standing areas shall be provided to permit the parking of vehicles involved in the delivery of consumables from blocking site roadways during unloading or loading. The road system shall be designed such that vehicles involved in the delivery of consumables can follow a continuous route through the plant area and leave again without going in reverse or carrying out complicated manoeuvres in order to exit the plant.
- d) Covered Parking facility to park a minimum 10 nos. of four wheelers at a time with pre cast paver block of approved make 60/80mm thick. With precast kerb stones along the edges.