



COCHIN PORT AUTHORITY

UPGRADATION OF FIRE FIGHTING FACILITIES OF TANKER TERMINALS AT COCHIN PORT OIL TANKER BERTH (NTB & STB)

SCOPE OF WORK AND SUPPLY FOR
CIVIL/STRUCTURAL WORKS
(STRUCTURAL)

PROJECT : UPGRADATION OF FIREFIGHTING
FACILITIES OF TANKER TERMINALS AT
COCHIN PORT OIL TANKER BERTH (NTB &
STB)
CLIENT : COCHIN PORT AUTHORITY
CONSULTANT : ENGINEERS INDIA LIMITED
EIL JOB NO. : C044

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	29.01.2026	ISSUED FOR TENDER	AP	DP	CS

1.0 SCOPE OF WORK

Cochin Port Authority (hereafter termed as CoPA) is one among the 13 Major Ports under Ministry of Ports, Shipping & Waterways, Govt. of India located in Ernakulam District, Kerala State. Majority of Cargo handled at Cochin Port are Crude Oil and POL Products. Cochin Port Authority (COPA) provided facilities in its four berths viz. North Tanker Berth (NTB) and South Tanker Berth (STB) (commonly known as Oil Tanker Berths -OTB), Cochin Oil Terminal (COT) and Oil Berth Q4 for handling of POL products.

South Tanker berth (STB) & North Tanker Berth (NTB) are adjacent berths commonly known as Oil Tanker Berths (OTB). STB handles ships of less than 20,000 Tonne deadweight capacity. NTB handles ships of 20,000 Tonne and above but less than 50,000 Tonne deadweight capacity. A common Fire water pump house is provided for catering to the fire water requirement of both the jetties.

Cochin Oil Terminal (COT), commissioned during 1984, handles ships of 100,000 Tonne deadweight or larger capacity.

Oil Berth- Q4 handles ships of 20,000 Tonne and above but less than 50,000 Tonne deadweight capacity.

CoPA propose to up-grade the Fire Fighting Facilities of above four Oil handling berths viz. North Tanker Berth(NTB), South Tanker Berth (STB), Cochin Oil Terminal (COT) and Oil Berth Q4 to the requirement of 50 latest OISD Standard 156 applicable for Fire Protection Facilities for Ports handling Hydrocarbons.

Engineers India Limited (EIL) has been entrusted by CoPA as Consultant for the aforementioned fire-fighting upgradation works.

This document capsulates brief scope of work to be carried out under NTB & STB for the necessary upgradation works.

CoPA shall not execute the works associated with STB at present time. Works related to NTB only to be considered in this present tender. All details documents in this scope of work & all other documents/ drawing forming part of tender document shall be read accordingly.

1.0 EXISTING FACILITIES & BRIEF DETAILS OF MODIFICATIONS TO BE CARRIED OUT (STRUCTURAL)

This document describes the broad scope of work and supply of CONTRACTOR for structural works.

This document shall be read in conjunction with the remainder (such as specifications, scope of works, design basis, drawings, applicable codes and standards etc) of the Bid document.

Requirements and provisions of design, drawings, specifications etc. contained in Bid documents are conceptual in nature, defining minimum requirements and are in no way exhaustive.

The above shall not relieve the CONTRACTOR from ensuring correctness of his deliverables and other activities and any changes required for this purpose (after award of work) are deemed to be included in the CONTRACTOR's scope of work, supply, execution and contract value/ price.

CONTRACTOR shall develop the design and detail engineering and shall complete all activities in his scope of work and supply meeting all the provisions, requirements and criteria of the Bid document.

During the tendering/ bidding stage, CONTRACTOR shall review and verify the contents of the Bid document and shall ensure his clear understanding of requirements, provisions and criteria of the same.

For this purpose, CONTRACTOR shall point out any errors, omissions, contradictions, or discrepancies etc. with suggestive rectification for review & necessary action/ decision before award of the job.

After award of work, it shall mean that CONTRACTOR has fully understood and accepted the provisions of Bid Document and has undertaken to fully comply with them.

There shall be no time and cost implication to the OWNER or COMPANY for design, detail engineering, construction, execution, installation and other activities performed by the EPC CONTRACTOR required for completing the job due to any upward revisions and/ or additions of quantities, specifications, sizes etc. given in the specifications and drawings etc. required to be made during execution of the works meeting all the provisions, requirements and criteria of Bid Document.

A brief details of existing facilities available at NTB & STB is tabulated as below:

Sl. No.	Installation/ Facility/ Equipment	Structural Modifications Required
A	Fire Pump House (common for both NTB & STB): [Located between NTB and STB berth]	<ul style="list-style-type: none"> • Constructed on marine piles. Size: Approx. 6.5 M x 11.5 M, Fire Control Room (1st Floor). • New structural extension with marine piles are required for extension of approximately 3500 mm X 6500 mm. The extension shall be built in with RCC framed construction of approximately 8000mm height. The extension shall be provided on marine piles to be founded under water level of 3.9m approx. • Structural supports for fixing of two numbers Fire Pumps and two numbers jockey pumps with making holes for vertical pumps, providing RCC supports for pumps, engine, structural steel supports for piping, valves, providing structural steel operating platforms, providing monorails for operation of HOT cranes, etc • Demolishing of mezzanine floor for making space for providing the jockey pumps. The beam shall be retained. Only slab demolition is envisaged. • Any other requirements specifically not mentioned herewith (however required as per requirements of other departmental scope of work) such as supports for equipment, etc shall also be considered part of the requirements. • Detailed engineering performing adequacy check of existing pump house and analysis, design, drawings modifications and construction of extension of pump house.
B	Foam Pump House (For NTB) [Located adjacent to Fire Pump House]	<ul style="list-style-type: none"> • Providing new foam pump house approximately Clear dimension of 4500 mm x 6000 mm. The new foam pump house shall be built in with RCC framed construction of minimum of 6 number of RCC piled construction. • Construction of new walkway for connecting new foam pump house and existing walkway shall be built in with RCC framed construction with RCC piled construction. • Detailed engineering performing analysis, design, drawings modifications and construction of new foam pump house and new walkway.
C	Fire Control Room (common for NTB & STB Jetty) [located in 1 st floor of Fire Pump House]	<ul style="list-style-type: none"> • Providing cantilever extension of control room of fire water pump house (1500mm X 3250mm) with structural steel brackets, and Chequered plates, providing floor and wall, windows as per requirements of architectural scope of work.

Sl. No.	Installation/ Facility/ Equipment	Structural Modifications Required
		<ul style="list-style-type: none"> Detailed engineering performing analysis, design, drawings modifications for control room extension.
D	NTB Jetty	<ul style="list-style-type: none"> Providing New fire monitor Towers - 2 Nos new on the NTB jetty. Detailed engineering performing analysis, design, drawings and construction of new fire monitor towers – 2 numbers. Demolition of two numbers fire monitor towers. Modifications, new pipe supports required, if any for routing Fire Waterlines and Foam pipe lines during detailed engineering
E	STB Jetty	<ul style="list-style-type: none"> Providing New fire monitor Towers - 2 Nos new on the NTB jetty. Providing fire proofing with vermiculate as per standard Detailed engineering performing analysis, design, drawings and construction of new fire monitor towers – 2 numbers. Demolition of two numbers fire monitor towers. Modifications, new pipe supports required, if any for routing Fire Waterlines and Foam pipe lines during detailed engineering
F	DG foundation and DG SHED	<ul style="list-style-type: none"> Providing Structural steel shed (With cladding) type construction for accommodating DG. Three side of shed shall be cladded upto eaves level and wire mesh to be provided below the same. Rolling shutter on entrance side shall be provided. The roofing, wire mesh, shutter shall be as per architectural requirements. Providing foundation for DG as per other departmental inputs and vendor requirements. The supports for providing exhaust for DG. Detailed engineering performing analysis, design, drawings modifications and construction of new DG foundation, DG shed, exhaust, etc.
G	Other supports for Electrical, piping, etc.	<ul style="list-style-type: none"> New Pipe Supports, Pipe sleepers, Operating/Access Platforms, Cross-overs, Valve Supports, buried and concrete Trenches, cable tray supports, miscellaneous supports and foundations etc. Detailed engineering performing analysis, design, drawings modifications and construction of new foam pump house and new walkway.

Any other structures not listed but required to complete the Scope of work for civil-structural works as per Overall plot plan, GA drawings & Architectural drawings attached elsewhere in the tender documents.

2.0 SCOPE OF WORK

The Contractor's scope of work consists of detailed engineering for analysis, design, fabrication / installation works, supply, procurement, fabrication, installation and construction of all civil & structural works related to the marine facilities, onshore facilities discussed as per Company's drawings, standards and specifications.

The detailed Civil /structural scope of supply/works for strengthening and providing new facilities of Fire water pump house shall include but not limited to the following:

Major Civil and Structural works involved shall include but not limited to the following:

- 2.1 Obtaining all statutory approvals from Owner, statutory authorities, local authorities such as Municipal authorities, Development authorities or any other concerned authorities before starting the work at site / after completion of works, wherever required.
- 2.2 Earthwork in excavation including dewatering by deploying adequate capacity of pumps or dewatering techniques, if required, below ground level for all types of soils and providing shoring & strutting, wherever required, by open and/ or closed timbering method.
- 2.3 Storing/ stacking excavated earth at safe location near foundation or at designated place for reuse inside the PLANT premises boundary as instructed by Owner/ Engineer-in-charge. Segregating unserviceable earth separately and disposing the same at designated place outside the PLANT premises boundary as instructed by Owner/ Engineer in charge.
- 2.4 Any barricading arrangement required in or around worksite due to safety reasons, shall be designed, constructed, dismantled and removed by contractor from site of work after completion of the project.
- 2.5 Backfilling at all depths with selected and approved earth available within or outside the premises boundary as instructed by Owner/ Engineer in charge and transportation & disposal of surplus earth and debris to the inside and outside the PLANT boundary as instructed by Owner/ Engineer in charge.
- 2.6 Earthwork in filling by excavating the earth from Borrow Areas arranged by contractor for all leads, transporting the earth from borrow area including cleaning & stripping the earth at borrow areas, breaking clods, loading, unloading and laying at all depths and heights.
- 2.7 Preparation of Bar Bending Schedule (BBS) for concrete structures as per the 'Approved for Construction' (AFC) drawings.
- 2.8 Supplying and fixing rebars in already cast concrete/ Existing concrete.
- 2.9 PCC works including lean concrete at all depths below foundations of all types, plinth beams, walls, non-suspended slabs etc. and in screed at all depths below plinth level.

- 2.10 PCC works including lean concrete in screed at all heights above plinth level.
- 2.11 RCC works in sub-structure for foundations of all types & shapes, including pile cap, open foundation, Raft for all structures including Pits, plinth beams, walls, basements, slabs, trenches, tanks etc. at all depths.
- 2.12 RCC works in super-structure at all elevations, columns, beams, walls, slabs etc. at all heights.
- 2.13 RCC works for trenches/culverts including RCC Precast covers and transportation of precast elements to site for erection and as directed by Engineer in Charge.
- 2.14 Supplying and mixing of approved brand of Bi-polar Concrete Penetrating Corrosion Inhibiting Admixture in all concrete as per manufacturer's specification for protection of reinforcement against corrosion.
- 2.15 Centring & shuttering in sub-structure at all depths and in super-structure at all heights/elevations.
- 2.16 Masonry works in sub-structure and super-structure for all depths and heights as per specifications.
- 2.17 Fixing of BITUMEN IMPREGNATED FIBRE BOARD conforming to IS: 1838 of approved quality in expansion joints at all locations and levels in concrete structures.
- 2.18 Sealing of EXPANSION JOINTS at all locations and levels in Concrete Structures with POLYSULPHIDE SEALING COMPOUND as per IS:12118 including raking of joints etc
- 2.19 Supplying and filling sand gravel mix or Murram below all foundations & Substructure as directed by Engineer-in-charge.
- 2.20 Supplying, providing and laying of Wedge shear element layers (WSEL+PCC) as ground improvement below foundations with rock stone pieces, filling of voids with smaller sized stone pieces, Metal, Coarse Aggregate & stone grit/silty sand/murram soil including spreading, layering, compacting with mechanical compactors along with PCC layering between adjacent WSEL as per Geotechnical recommendations, specifications, drawings and directions of Engineer-In-Charge.
- 2.21 Supplying, providing & installing 4-inch diameter Galvanized Steel Pipe medium duty series as per IS 1239, 2.5m long filled with (1:1:1) concrete with cutting edge along with installation in founding sub-soil strata, firmly held in position in WSEL layer at top including positioning and installation (vertical/raked) as per drawings, specifications and directions of Engineer-In-Charge.

- 2.22 Structural steel works with rolled steel, parallel flange and built-up sections or tubular/hollow sections, including fabrication, erection and preparation of typical detailed fabrication drawings for all types of structures at all locations and heights in sub-structure & super-structure.
- 2.23 Supply, Fabrication and placing of Electro-forged hot dipped galvanized welded MS grating for all type of platforms, etc., the minimum thickness of galvanizing shall be 120 microns.
- 2.24 Providing chemical anchor fasteners and bolts to fix structures/ pipe supports etc. on pavement/ foundations/ structures.
- 2.25 Supply, fabrication and erection of anchor bolts and their complete assemblies, pipe sleeves, rungs etc. in RCC works at all levels both in foundation and in superstructure as required.
- 2.26 Supply, fabrication and placing of MS insert plates, angles and anchor bolts etc. in RCC works at all levels, as per design requirement.
- 2.27 Supply, Fabrication, Providing & fixing MS chequered plates at all heights on structures as required.
- 2.28 Protective coating including Surface Preparation, Primer & Finish Paint for Structural steel, Ladder, Stairways, Handrail etc., shall be as per Job specification.
- 2.29 Dismantling/ Demolishing of PCC/ RCC, Masonry for all depths below plinth level and all heights above plinth level including disposal of unserviceable item. Stacking & depositing of serviceable items in Owner's yard / location as approved by Engineer-in- Charge.
- 2.30 Dismantling/Demolishing & re-erection of structural steel for all depths and all heights above plinth level including disposal of unserviceable item. Stacking & depositing of serviceable items in Owner's yard, location as approved by Engineer-in- Charge.
- 2.31 Grouting of all steel structures / equipment foundations as per design basis.
- 2.32 Fabrication of structure steel shall be done in contractor's fabrication shop outside/inside plant boundary and shall be transported to project site.
- 2.33 Fabrication & placing/ erection of miscellaneous steel items like Anchor Bolts, Metal Insert Plates, Pipe Sleeves, Rungs, Pre-fabricated handrailing etc. as per EIL standards/ specification/ as directed by Engineer-in-charge at any location wherever required.
- 2.34 The bidder shall indemnify owner including royalties for all the items to be disposed beyond the PLANT/plant premises boundary.
- 2.35 Providing and applying approved Epoxy Resin for bonding of fresh concrete to old concrete in all types of structure at all depths and heights.

- 2.36 Furnishing activity wise work program and taking necessary approvals from related departments in the Client/Engineering Consultants before carrying out any activity in the sites. Any statutory approval, if required, shall also be taken.
- 2.37 Preparation of AS-BUILT mark-up prints on AFC drawings and subsequent updating of the same in soft copy (AutoCAD) of AFC drawing and submission of hard copy and soft copy to Engineer-in-charge as specified elsewhere in this Bid package.
- 2.38 Removal of scrap, generated during construction, includes segregation of scrap into serviceable and unserviceable material and transportation of serviceable material to Owner's storage.
- 2.39 Removal & clearing of construction debris, waste material, all unserviceable material etc. includes clearing the site after completion of work and transportation of the same at dumping location outside the PLANT boundary to be arranged by Contractor without indemnifying the Company.

Any other Civil Structural Works, not specifically mentioned herein, but required for the satisfactory and successful completion of the project as per directions of the Engineer-in-Charge shall also be in the scope of the contractor.

Pre-Construction Survey

- 2.2.1 The Contractor shall establish the suitable reference benchmarks for survey and construction works and provide its level relative to Chart Datum.
- 2.2.2 Contractor shall carry out preconstruction and post construction surveys of repair works to confirm all the details provided in the tender document and the Technical Documents. The details obtained from the survey shall be submitted to the Company for approval. The Cost for such surveys shall be considered included in the SOR rates for various SOR items.

3.0 DRAWINGS / DOCUMENTS REQUIRED FOR REVIEW

Engineering, Fabrication, Construction and Installation

Contractor shall perform all detailed engineering required for the works and including, without limitation as provided in Clause 1.0. The following shall also be required in addition to the listed items,

- a. Design of temporary structures, pile-muff, etc.
- b. Design of fabrication, transportation and installation aids on casing piles, precast elements etc., as per Contractor's methodology of fabrication and installation.
- c. Bar bending schedule for all RCC works.
- d. Structural material take-off.
- e. Fabrication drawings for steel structures, loadout from onshore yard, transportation and installation

- f. Preparation of purchase specifications for all vendor items, incorporating Company's comments.
- g. Preparation of construction methodology for strengthening of existing structures and new pump
- h. As-built drawings.

The above-mentioned engineering documents shall be submitted to the Company for review and approval. All comments of the Company shall be incorporated by the Contractor.

- The drawings / documents related to all structural works submitted by the Contractor shall be reviewed by EIL / CoPA. EIL may review and offer comments / suggestions to revise these design / drawings accordingly and Contractor shall incorporate the same in the construction without any extra cost to the CoPA, maintaining the original time schedule. However, complete correctness / soundness of these design / drawings and their execution at site shall be sole responsibility of the Contractor. Any defect observed during commissioning and operating the system shall be rectified by the Contractor by carrying out necessary modifications without any extra cost to the CoPA.
- The drawings / documents for Firewater spray and foam system for storage tanks attached with the tender document are indicative of the scope of work and are issued for tender purpose only. The documents indicate the general scheme as well as the layout to enable the bidder to make an offer and design the system in line with the requirements of the CoPA. The schedule of submission of various drawings and documents shall be given by the Contractor in their offer.
- Successful bidder shall be required to present documentation of all proposed design, installation and testing procedures for review and approval by EIL / CoPA progressively. The fabrication / construction shall commence only after EIL review / approval has been obtained.
- The Contractor shall incorporate EIL / CoPA's comments on their documents / drawings (without any cost and time effect) if any, on document and resubmit the same for EIL / CoPA review.
- All documents, drawings submitted by Contractor shall be provided in 3 numbers Hard copies + 1 Soft copy. Contractor shall submit soft files such as STAAD files, excel spreadsheets as and when required for Review.
- Final documentation, As- built Drawings shall be provided with all soft files.

4.0 SCOPE OF SUPPLY

4.1 CoPA's Scope of Supply

Nil

4.2 Contractor's Scope of Supply

All materials (consumables/ non-consumables) including tools, tackles, plant machinery, workers/labours, etc. required for completion of the works as per Schedule of Rates shall be in contractor's scope of supply and shall be the responsibility of Contractor within the quoted rates under this contract.

All material shall be of approved brand/ make as per the list of approved brands / vendors for Civil Structural items attached elsewhere in the contract. However, in case of any deviation from the list of approved brands / vendors, prior approval from Client / Engineer In-charge shall be obtained prior to use of the material at site.

4.3 Marine Spread

- Marine spread for transportation and installation of material, pre-cast structural components, in-situ concreting works, boring and piling works etc including mobilization, de-mobilization, obtaining clearances and statutory approvals from concerned authorities.
- Installation of liner/casing piles, boring in soil/rock and providing vertical bored cast-in-situ reinforced concrete piles and providing temporary supports for casings (as per residual engineering). Special care shall be taken care during construction of RCC bored cast-in-situ piles as per the technical specifications enclosed elsewhere in the tender documents.
- Mobilization and demobilization of all construction equipment.
- Maintaining smooth co-ordination between various Sub-Contractors appointed by the Contractor and ensuring timely completion of works.
- The Contractor shall extend all facilitation and cooperation for other Contractor's for simultaneous execution of works in the area entrusted by the Company.

4.4 In addition to the above requirements specified in this document, the works to be carried out by the Contractor shall include the following:

- provision of all services, labor, equipment and material (whether of a temporary or permanent nature) required for the design, engineering, procurement, inspection, delivery at Site, erection, construction, testing at Supplier's shop or Site, Commissioning Assistance.
- Setting out, clearances of site before setting out and clearance of works after completion.
- A detailed program for the construction and completion of work (using CPM/PERT techniques) giving, in addition to construction activities, detailed network activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/equipment and their installation and testing, and for all activities of the employer that are likely to affect the progress of work, etc., including updating of all such activities on the basis of the decisions taken at the periodic site review meetings or as directed by the Engineer.
- Samples of various materials proposed to be used on the work for conducting all tests thereon as required per the provisions of the Contract.
- Testing of various materials including soil, rock, coarse and fine aggregates, design of mixes and all testing for the same, drilling of cores from finished work and testing the same and all other work tests as per the requirements of the specifications and furnishing test reports/certificates.
- Inspection reports in the respect of various items of work as per the relevant specifications.

- Any other data, which may be required as per the specifications or the conditions of Contract or any other annexure forming a part of Contract.
- Design, preparation of drawing, obtaining approval of Engineer of all temporary works.
- Establishing and running a laboratory with facilities for testing of various items of works as per the requirement of work and as directed by the Engineer.
- Quality assurance and Quality control.
- Cost of safe guarding the environment.
- Cost of adherence to dock safety and security regulation including cost of entry permits, work permits and other statutory approvals/certificates.
- Hot works shall be carried out with the approval of Company.
- The work shall be carried out by the Contractor without causing any damage to Port's / any other structures, cables, pipes etc., passing through the area of work. Any damage caused by Contractor's operation shall be compensated/made good at Contractor's risk and cost to the satisfaction of Company, failing which the Company will do rectification work and the cost incurred will be recovered from any sum due to Contractor.
- Reconditioning of the land at site area on completion of work at site, scraps dumping out of site as well as removal of any ancillary and temporary foundation blocks which the Contractor might have had to pour.
- The muck removed from the boreholes of piles, debris during surface preparation of damaged areas of structural elements and debris due to dismantling of defunct fender dolphin, gravity fenders, precast slabs etc., shall be conveyed and deposited at the northern side of the bund connecting two islands behind COT or in the Islands behind COT by constructing suitable bunds around the dumping area by the Contractor at their own cost.
- Supply and maintenance of erection tools and handling means including in particular engines, welding machines and air compressors. Contractor shall be responsible for supply of the related fuels, lubricants and consumables including supply and storage of electrodes or filler metal needing for welding.
- Supply and maintenance of hoisting means including divers and fuels (hoisting means shall be compatible with soil characteristics at site).
- Necessary temporary facilities, lines and connection phases.
- Production, supply, and distribution of freshwater, electric power, fuels, telecommunication for construction and other consumables from the source of supply up to the point of consumption, along with corresponding distribution networks, safety and protection systems.
- Procurement, storage, supply and distribution of consumables, spare parts, chemicals for construction, commissioning assistance and test phases for facilities up to the provisional acceptance date.
- All temporary works housing and office spaces and services, including first aid and sanitary facilities, shelters, black room, warehouse, catering and canteen etc.
- Receipt of Contractor's items and storage, handling, assembly, installation and pre-commissioning of such equipment in due manner and with, if necessary, the assistance of supplier's representative.
- Keeping site permanently tidy and clean.
- Arranging locations made availability by Company for permanent and temporary works.

- The Contractor shall provide boat/dinghy/machuva (s) etc., at his own cost, as and when required by the Company for survey and supervision works, throughout the Contract period.
- Installing and maintaining all sanitary blocks, including sewage discharge, as required by the Indian rules and regulation, for Contractor's and Supplier's personnel.
- Compliance by all the Contractor's personnel with all site regulations and safety norms.

5.0 SPECIFIC REQUIREMENTS

- 5.1 Mandatory use of mechanical excavators for excavation, however manual excavation for minor foundation can be taken up after due approval of Engineer-in-Charge.
- 5.2 Use of Ready-mixed Concrete (RMC) is mandatory for all reinforced concrete works However Weigh Batching concreting using Design Mix Proportion for all reinforced concrete works can be taken up after due approval of Engineer-in-Charge.
- 5.3 For borrowed earth or surplus earth disposal from outside premises boundary, location for borrow area/ disposal of surplus earth, debris to be identified by the contractor. Contractor shall obtain relevant statutory approval from all statutory authorities (like corporation, municipal etc.) and including payment of charges/ royalty/ octroi for the same. Contractor shall keep client indemnified of any liability and/ or complaint from local authorities/ municipal bodies.
- 5.4 Dewatering by suitable method wherever required shall be carried out by the contractor at his own cost.
- 5.5 For cutting & bending of rebars mechanized equipment/ cutting-bending machine shall be used. Various tolerances and verticality of bars shall be maintained.
- 5.6 Structural concrete mix shall be approved Design Mix as per EIL specification 6-68-0004. The mix design shall be carried out in approved NABL accredited laboratory.
- 5.7 Mandatory use of bipolar concrete penetrating corrosion inhibiting admixture in all concrete works.
- 5.8 Generally, the use of the following cements shall be considered.
- 43/53 Grade Ordinary Portland Cement (OPC) Conforming IS: 8112 & IS: 12269.
 - Portland Pozzolana Cement (PPC, fly ash based) confirming to IS: 1489 (Part 1).
 - Portland Pozzolana Cement (PPC, calcined based) confirming to IS: 1489 (Part 2).
 - Portland Slag Cement (PSC) Conforming to IS: 455.
- 5.9 Reinforcing steel shall be high yield strength deformed steel bars (TMT) of grade Fe500D / Fe500D (CRS) conforming to IS: 1786.
- 5.10 Structural steel shall be of grade E350 Quality BR / B0 Conforming to IS: 2062.

- 5.11 Painting including shop primer to Structural Steel shall be as per the painting Job specification.
- 5.12 Structural steel (Tubular/Hollow Sections) shall be of grade Yst310 conforming to IS: 1161.
- 5.13 All lugs shall be of high yield strength deformed bars (TMT) of minimum grade Fe500D / Fe500D (CRS) conforming to IS: 1786.
- 5.14 All Connection Bolts shall be High Strength Hot Dip Galvanized Structural Steel Bolts of Property Class 8.8 (minimum) conforming to IS: 3757 & IS: 4000. Hexagonal Nuts shall conform to IS: 6623. Washers shall conform to IS: 6649. All Anchor bolts shall be provided with double nut.
- 5.15 Anchor bolts shall be of mild steel E250 Quality BR/ B0 Conforming to IS:2062. All primer/ epoxy except finish paint shall be applied to all insert/sleeve prior to fixing in position before pouring of concrete.
- 5.16 All inserts/ sleeves shall be properly secured in position before pouring of concrete. Metal insert plates, base plates, chequered plates, cover plates for fire proofing, grating & steel structure in platforms taken from equipment only shall be of grade E250 B0/ BR conforming to IS: 2062. Primer/ epoxy except finish paint shall be applied to all inserts/ sleeve prior to fixing in position before pouring of concrete.
- 5.17 Local Barricading & dewatering wherever required shall be carried out by the Contractor within the quoted price. No separate payment shall be made towards these activities.
- 5.18 Sand filling below floor and at all locations as specified directed by Engineer-in-charge.
- 5.19 Crystalline water-proofing compound of approved make as per CPWD specification shall be mixed with concrete for all liquid retaining/ leak-proof structures.
- 5.20 Grouting of all equipment & Structural steel including supply of grouting material.
- 5.21 Preparation of detailed fabrication drawings using software, including submission of design calculation for connections, showing the master index of particular structures indicating nomenclature to facilitate sequence of erection activity, for all types of structures. Connections in fabrication drawing shall be prepared only after review of connection details by owner. Final model shall be submitted for records which shall include all fabrication drawing, related files, catalogues along with all erection/ part marks and material reports.
- 5.22 Various tolerances required as marked on the drawings conforming to code requirements/ specifications or as directed by the Engineer-in-Charge shall be maintained by the Contractor. Verticality shall be maintained at every stage and the same shall be verified with Theodolite / Total Station.

- 5.23 During the performance of the work, the contractor, at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise by approved means which shall be supplied and installed by the Contractor as required till such time the installation work is satisfactorily completed. The provided guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by him or other agencies.
- 5.24 The contractor shall ensure proper co-ordination / co-operation with other agencies, while working in the unit area, without affecting others work front areas.
- 5.25 The construction of underground piping & drainage system, if provided at a depth lower than that of the structure/equipment foundations, shall be taken up before construction of respective foundation. However, in general underground piping activity shall be executed before backfilling of soil.
- 5.26 The contractor shall ensure the required founding strata conforming to soil recommendation for all foundations and bring it to the notice of engineer-in-charge, if the founding depth encountered is different from that specified in the drawings.
- 5.27 Proper management of loose earth, mud, water is to be ensured to avoid making the area messy and slippery. Necessary arrangements shall be made to avoid water and mud ingress to the existing system.
- 5.28 It is to be ensured that no restriction in movement takes place for operating personnel, crane, forklift, fire trucks, etc.
- 5.29 An experienced safety engineer shall be deployed at site to ensure that the construction work is carried out in a safest manner and shall work in coordination with Client / EIL.
- 5.30 Surface preparation shall be carried out as per painting specification attached elsewhere in the bid document for all structural works and the type of environment to be considered for selection of painting system for all structural works shall be as per Standard specification for Surface preparation and protective coating.
- 5.31 All works shall be done to the entire satisfaction of the Engineer-in-Charge. Any work not carried out in accordance with the instructions shall be dismantled and made good without any extra cost and time implication to the owner.

STATUTORY REQUIREMENTS

Contractor shall indemnify the Company from all necessary statutory requirements. All such requirements including Health, Safety, Environment, Dock safety & security or any other statutory approvals from statutory bodies shall be in the scope of Contractor.

6.0 PREAMBLE TO SCHEDULE OF QUANTITIES

- 6.1 Depth of open foundation in general shall be of maximum 6.0 m below HPP (This data is for general guidance of the Contractors; however, deviation from the noted depth shall not form a basis for any extra claim).
- 6.2 The maximum approximate height of structures shall be 25.0 m (This data is for general guidance of the Contractors; however, deviation from the noted height shall not form a basis for any extra claim).
- 6.3 The expected water table depth may fluctuate. The quoted rate of excavation shall include requirement of dewatering etc. for completion of total works including concreting, backfilling etc. and no extra amount is payable on this account.
- 6.4 All items in the Schedule of Rates shall be inclusive of all material, workmen, constructional infrastructures like scaffolding/ staging, finishing, cleaning, cutting chases/ holes etc. in brick work/ RCC work and making good the same and rectification of any damaged work shall be applicable for all heights and locations
- 6.5 Item description provided in Schedule of Rates (Short Description) is in brief; while quoting and filling the rate in the Schedule of Rates (Short Description), Bidder shall take into consideration complete scope of work/item description as mentioned in Schedule of Rates (Detailed Description) for the relevant item. The rate quoted in Schedule of Rates (Short Description) shall be deemed to include all activities of work mentioned in item description of Schedule of Rates (Detailed), scope of work, specifications, standards etc. & stringent of all shall govern.
- 6.6 The cement content and water-cement ratio for RCC & PCC works shall be as per Geotechnical Recommendation unless otherwise specified. However, the minimum cement content and maximum water-cement ratio as per IS: 456 as below:

Exposure condition	Type of concrete	Minimum Grade of Concrete	Minimum Cement content (kg/m ³)	Maximum free WCR
Severe	Plain concrete	M20	250	0.5
	RCC for Marine / Substructure	M40	320	0.45
	RCC for Marine / Super Structure	M40	320	0.45

7.0 LIST OF ATTACHMENTS

7.1 STANDARDS

Sl. No.	Document Number	Title of document	Rev.
1.	7-68-0051	Standard lifting hooks in precast slabs & chequered plates	7
2.	7-68-0052	Details of M.S. rungs for conc. Structures	8

Sl. No.	Document Number	Title of document	Rev.
3.	7-68-0056	Metal Insert Plates	8
4.	7-68-0057	Edge protection to RCC columns and floor slabs at expansion joints	7
5.	7-68-0062	Typical cranking detail of rebar at beam & col. junctions	7
6.	7-68-0065	Expansion joints in Buildings	7
7.	7-68-0066	Standard Lintels	6
8.	7-68-0067	Structural details of misc. architectural features	2
9.	7-68-0101	Standard re-bar shapes and cut length computation	7
10.	7-68-0102	Adjustment of stirrups at beam crossing	6
11.	7-68-0103	Reinforcement details at circular cut-out in slab	7
12.	7-68-0104	Reinforcement details at Square/Rectangle cut out in slab	7
13.	7-68-0201	Standard lugs	7
14.	7-68-0202	Typical grating support.	8
15.	7-68-0203	Typical chequered plate supports	8
16.	7-68-0205	Crane rail fixing details	6
17.	7-68-0251	Welding symbols	7
18.	7-68-0417	MS Anchor Bolt Assemblies	9
19.	7-68-0506	Steel Stairs	8
20.	7-68-0507	Details of Steel ladder	9
21.	7-68-0509	Steel ladder joint details	8
22.	7-68-0654	Detail of moment connection for MC [] column to MC [] beam.	4
23.	7-68-0658	Bolted shear connection details for beam to beam	1
24.	7-68-0660	Typ. detail of moment connection with MB col. to MB beam	3
25.	7-68-0683	Monorail fixing details with steel members	5
26.	7-68-0684	Monorail fixing details with R.C.C. Beam	5
27.	7-68-0689	Shear connections welded type - beam to beam	4
28.	7-68-0690	Bolted moment connection detail	0
29.	7-68-0695	Electrical cable tray supporting structure.	4
30.	7-67-0008	Pedestal for stair/ladder.	8
31.	7-67-0011	Flooring details for Buildings	6

Sl. No.	Document Number	Title of document	Rev.
32.	7-67-0687	Details of block foundation for transformers (upto 2500 kVA rating)	6
33.	7-60-0801	Standard handrails for offshore structures	4
34.	7-60-0802	Standard grating details	4
35.	6-68-0003	Fire proofing	2

7.2 SPECIFICATIONS

Sl. No.	Document Number	Title of document	Rev.
1.	6-68-0001	Standard specification – Civil and Structural works – general scope.	6
2.	6-68-0002	Standard specification – Civil & Structural works – materials.	7
3.	6-68-0003	Standard specification – Civil & Structural works – earth work.	6
4.	6-68-0004	Standard specification – Civil & Structural works – plain & reinforced cement concrete	8
5.	6-68-0005	Standard specification – Civil & Structural works – reinforced cement concrete in liquid retaining structures.	6
6.	6-68-0006	Standard specification – Civil & Structural works – structural steel works.	8
7.	6-68-0007	Standard specification – Civil & Structural works – structural steel works (Tubular/Hollow Sections).	8
8.	6-68-0008	Technical specification - Civil & Structural works – miscellaneous steel works	8
9.	6-68-0009	Standard specification – Civil & Structural works – brick masonry.	5
10.	6-68-0012	Standard specification – Civil & Structural works – Demolition & Dismantling.	6
11.	6-68-0013	Standard specification – Civil & Structural works – Miscellaneous items.	6
12.	6-68-0014	Civil & Structural works - Precast concrete	2
13.	6-68-0015	Standard specification for modular construction of pipe racks and technological structures in units	2
14.	6-68-0017	Standard specification: civil & structural works - bipolar concrete penetrating corrosion inhibiting admixture	2
15.	6-68-0035	Standard specification: Civil & Structural works - water-proofing of underground concrete structures.	1

Sl. No.	Document Number	Title of document	Rev.
16.	6-68-0056	Standard specification – Civil & Structural works- Bonding Fresh Concrete to old Concrete by Epoxy Resin Bonding System.	5
17.	6-78-0001	Specification for quality management system requirements from bidders	3
18.	6-78-0002	Specification for documentation requirements from contractors	3
19.	6-78-0003	Specification for documentation requirements from suppliers	3
20.	6-82-1010	Inspection & Test Plan (ITP) for incoming material checking for contractor's supplied materials	3
21.	6-82-3100	Inspection & test plan (ITP) for civil, structural & architectural works (item rate contracts – with categorization).	2
22.	C044-000-83-43-TS01	Technical Specification for Bored Cast-in-situ RCC Piles	
23.	C044-000-83-43-TS02	Technical Specification for Miscellaneous Items	

8.0 ANNEXURE

Refer Departmental List of approved vendors for Civil-Structural Works enclosed elsewhere in Tender.

Specifications of the product shall be checked against tender specifications before selecting any product/brand. In case of any discrepancy, tender item/ specifications shall prevail, and any such product/brand shall not be used which is not conforming to tender specifications even if it is appearing in the list.

In case of any non-availability of approved products for use in civil structural works mentioned in Annexure alternative product/ Brand name shall be proposed by the vendor to the RCM and same has to send to EIL, HO for final approval.

9.0 SOR

For schedule of rates, refer following document:

1. C044-000-83-43- SOR-9501