



**Project Title:** Design, Supply, Installation of Firefighting system and associated facilities including Operation & Maintenance thereof for a period of five years as per OISD-156 at Oil Jetty no. 08, Deendayal Port Authority- Kandla

**Document Title:** Vol II of III Employer's Requirements and O& MC

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## PART A EMPLOYERS REQUIREMENTS

### 1.0 INTRODUCTION

#### 1.1 Project Description

Deendayal Port Authority (DPA) previously known as Deendayal Port Trust is a seaport in Kutch District of Gujarat state in western India, near the city of Gandhidham Located on the Gulf of Kutch, it is one of major ports on west coast.

It is the largest port of India by volume of cargo handled. Deendayal Port Authority, India's busiest major port in recent years, is gearing up to add substantial cargo handling capacity.

Port has six Oil Jetties (OJ 1 to OJ 6 and OJ 7 & OJ 8 are under construction). First four Oil Jetties i.e., OJ – OJ 4, constructed during 1975 to 2000 belong to Port and remaining oil jetties i.e., OJ 7 and OJ 8 which are developed, operated and maintained by M/s. IFFCO and M/s. IOCL respectively.

Port requires the services of EPC (Engineering, Procurement and Construction) contractor for Design, Supply, Installation of Firefighting system and associated facilities including Operation & Maintenance thereof for a period of five years as per OISD-156 at Oil Jetty no. 08, Deendayal Port Authority- Kandla in accordance Scope of Work.

The Plant/Equipment/Services offered by the tenderer shall be best suited for Climatic conditions prevailing at Kandla Port site.

DPA intends to install new firefighting system and associated facilities which covers the OJ 8, Manifolds, Battery limits and control room. In line to this requirement, the bidder shall provide all the facilities as per the Scope of the work and Technical Specifications.

The Scope of the work and Technical Specifications are only indicative, but not limited. However the Bidder shall visit the site and collect all the details before submission of the Bid.

Time completion of the project is 8 months from the issuance of the work order.

##### 1.1.1 Meteorological Data:

##### a) SIZE OF TANKERS TO BE HANDLED

- The jetty has been designed for the following type of vessel:

Vessel Parameters	Vessel Specifications
	Tanker
Size (m)	140- 300
Draught (m)	14.5
Height (m)	18.0



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Beam Width (m)	25-50 m
Site Condition	Sheltered
Berthing velocity (m/s)	0.15 (As per Table 2 of IS 4651 -Part III)
Berthing condition	Difficult
DWT (tons)	25,000 to 1,00,000

Note:- The jetty is to be designed as for handling POL products including LPG.

- b) The following are the particulars of tidal levels related to the chart datum at the Kandla Tidal station:

Highest High water level:	(+) 7.59 m
Mean High water spring:	(+) 6.66 m
Mean High water Neap:	(+) 5.71 m
Mean Sea level:	(+) 3.88 m
Mean Low Water Neap:	(+) 1.80 m
Mean Low water spring:	(+) 0.80 m
Lowest Low water level:	(-) 0.90 m

- c) Meteorology

The climate at Kandla is governed by the monsoons. In the months June-September, the south-west monsoon occurs. The later period is often indicated as the post-monsoon period.

- Winds

Non cyclonic maximum winds (30-40 kmph) occur during May-August. Wind speeds are relatively less during North East Monsoon. However, wind speeds up to 180 KMPH have been observed during cyclonic storms.

- Rainfall

Rainfall at Kandla is low. Annual average rainfall is about 322 mm per annum with the total number of rainy days of 17 per year, about 90% of which is received during the south-west monsoon season, i.e., between June and September with a maximum of 153 mm in July. April and May are dry months with average rainfall below 0.6 mm per month.

- Temperature

The mean daily maximum temperature is 34°C and with 45°C the highest occurring in May. Mean daily minimum temperature is 20°C and with 12°C the lowest occurring in January.

- Visibility

Throughout the year visibility is good as the region has zero fog days. However, during rains and squalls, the visibility deteriorates.



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- **Relative Humidity**

Relative humidity is generally high and rises to about 80% during the monsoons in the month of August.

- **Oceanography-Tides**

The tides at Deendayal Port are semi-diurnal with tidal levels, relative to the Chart Datum (CD), as follows:

- ☐ Mean High Water Spring (MHWS) +6.6m
- ☐ Mean High Water Neap (MHWN) +5.7m
- ☐ Mean Sea Level (MSL) +3.8m
- ☐ Mean Low Water Neap (MLWN) +1.8m

- **Cyclone**

In general, the west coast of India is less prone to cyclonic storms compared to the east coast. It is observed from the cyclonic tracks in the Arabian Sea that only 6 storms endangering the Kandla coast have occurred till date with maximum speed recorded was 100 kmph. However, in 1998 a severe cyclone hit the Deendayal Port with a wind speed of 150 kmph resulting in high tidal waves of 10.5m causing extensive damage to port installations.

- **Geotechnical Data**

Based on the geotechnical information, the Deendayal Port area substrata comprises of silty clay up to 10m depth below seabed followed by hard silty clay up to 26 m and beyond which is dense sand. Any heavy engineering structure would require piled foundations. Factor of Safety for Vertical and Uplift Capacity is considered as 2.5 and 3.0 respectively. Static / Dynamic Pile Load Test shall check adequacy of Pile Capacity at 2.5 times the design load. Pile efficiency in group shall be taken as 80% of Design capacity of Pile.

- **Topography**

Topography at the proposed location berth OJ-8 is +9.14m RL.

- **Seismic Loads**

Kandla is located at Seismic Zone –V, as defined in IS:1893-2002.

- **Road Connectivity**

Kandla Port is connected with National Highways NH 8A connecting Ahmedabad and Mundra/ Mandvi through Gandhidham. The four lane NH 8A extends right up to the port's main gate. The port is also connected through NH 141. The port also has fully developed road network, both in and around the Port area to facilitate faster movement of cargo. The road network within the port area is as below:

Inside Cargo jetty area: 30km, Outside Cargo Jetty area: 31km

## 1.2 Scope of work



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a) The indicative scope of work of this package shall include basic & detailed design based on requirements stipulated in tender, engineering, procurements of material, fabrication/assembly, shop painting, shop testing, packaging, loading, dispatch to site, unloading, storage, unpacking, handling at site, erection, site testing, site painting, flushing, commissioning & final handing over of defect free integrated commissioned system for the following major items.

- Fire Water Network which includes, Fire water pumps, Fire Water piping, Hydrants, monitors, hose boxes, water cum foam monitors, tower monitors, jumbo nozzles etc.
- Foam system, including Foam Tanks, Foam pumps, Foam distribution network, ILBP etc.
- Fixed Water Spray system for Tower Monitors Structure Manifolds at Jetty, and any other area at battery limits as per the design requirement.
- EOT Crane for Fire Water Pump houses
- Portable & Wheeled fire Extinguishers as per OISD-156 requirements.
- Safety Equipment in Fire Station as per OISD-156 requirements.
- First Aid Fire Fighting Equipment as per OISD-156 requirements
- Fire Detection, Alarm & Communication System to cover the entire project (Battery limits) area

Battery limits- Battery Limit is the geographic boundaries identifying scope of works for units, facilities, systems covering the entire area of OJ 8 jetty including Manifold, if any.

- International Shore Fire Connection as per the standards.
- Complete Civil, Structural, instrumentation & Electrical Works for all the mentioned facilities.
- Operation and Maintenance Contract for Complete system for all the facilities installed by the contractor for a period of 5 years after commissioning of all the facilities (which includes defect liability period of one year).

b) The contractor shall include all supports, inserts etc. required for the above system, instrumentation & electrics of the system, valves and all necessary operating platforms and ladders, if required, for the safety and maintenance of the equipment and the system as a whole including interface connections, co-ordination with existing systems so as to make the entire system (both existing & newly installed) functional in all respect.

c) The above scope of work is only indicative, but not limited. However, the Contractor has to ensure completeness of the Fire-fighting Project in all aspects to the satisfaction of the Statutory requirements viz., OISD-156, PESO and Employer by following all the latest Amendments, Specifications, Codes and Standards.

d) It should be noted by the bidders that the information, size, specifications, & dimensions mentioned in this document are indicative only. As in Turnkey Contracts, the successful bidder shall workout detail drawings during detail engineering stage meeting the functional



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requirements & relevant IS standards, well within the sanctioned estimate, and submit the fresh drawings for approval to employer & PESO as per OISD-156 standard.

e) Any additional item/ component that are not specifically mentioned in the specification but are required to make the system/ equipment complete in all respects for safe operation and guaranteed performance shall be under the scope of the contractor at no extra cost.

f) The contractor shall furnish the names of the sub-suppliers, if any, along with the units / quantity to be procured from them. List of approved makes of materials is enclosed in the tender document. Only those vendors shall be acceptable for whom the names are specified against the items. For any other item not mentioned in the list, the successful party will take prior approval before placement of order.

g) The firefighting measures are of paramount importance to safeguard the material, product / information stored manpower and property from the fire hazards. Water & Foam has been considered as the general agent for fire extinguishments / cooling at the proposed installations. This water shall be made to reach at all the strategic points of the installations through a closed pressurized piping network.

h) The system covers the basic scheme to be implemented to cater fire hazard in the entire area, as per OISD: 117, OISD:118, OISD:244, OISD: 189 TAC / NFPA, PNGRB.

i) The indicative scope of work and services to be rendered by the Tenderer for installation of fire protection system shall include but shall not be limited to the following activities:

- Design, Engineering, Supply, Erection, alignment, cutting, edge preparation, fitting, welding, testing, painting and commissioning of all items covered, as per the enclosed specifications. This shall include the complete piping, valves/strainers etc. (with companion flanges), fittings, etc. required for handling the complete firefighting system & foam system and additional facilities. The firefighting pipeline network shall also be provided underground with suitable protection to the pipe at crossovers and under culverts as per the standard practice.
- Miscellaneous materials and services, if not otherwise specifically asked for, shall include the following:
  - Constructing site office, covered store, open storage at designated place including supply of construction material and removal of the same on completion of work.
  - Site cleaning, removal and disposal of debris, maintaining clean condition in and around the working place and as instructed by authorized representative of Employer.
  - All piping integral to or between any equipment furnished under this specification, except as otherwise specified.
  - All necessary isolation valves fitting at the tapping points and branch pipes.
  - All erection accessories, consumables and miscellaneous materials, though not specifically indicated in this specification, but actually required for completing the job in all respects.
  - All necessary connections for hook-up with Purchaser's pipe network.
  - Erection, testing and commissioning of materials and system as a whole.
  - Initial fills of fuel , foam, consumables, gas and other fire extinguishing media.





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- All necessary fixtures, supports.
- To obtain No Objection Certificate from the local statutory fire authorities for the complete system.
- Construction of RCC foundation of equipment & pedestals for supporting the water and foam pipelines, valves and all other equipment etc.
- Supply of all inserts, anchor bolts, final adjustment of foundation levels, dressing of foundation surfaces, bedding and grouting of anchor bolts in to the constructed civil works, cutting and patching up of the existing concrete structure, as may be required for the erection of the equipment. Any civil work if damaged by the Tenderer during the erection work shall be rectified by the Tenderer at his own cost, to the satisfaction of DPA.
- Excavation to the required depth in all types of soil, alignment, welding, fitting, testing, laying buried pipes and refilling the trench as per the specification.
- Wrapping and coating buried pipes as per specification for protection from corrosion.
- The Tenderer shall supply at his cost, all necessary skilled and unskilled personnel, construction equipments, cranes, hoists, tools and tackles, instruments, safety implements and barriers and other accessories required for assembly, erection, testing and commissioning of the system. The Tenderer shall provide Pre-OISD and OISD inspection assistance for demonstrating the firefighting facilities and carrying out the modifications as suggested by the inspection team.
- Successful Tenderer shall be agreeable to include any other jobs not covered in the tender but required for completion/ commissioning of the items covered under this contract. The rates quoted shall be deemed to include all jobs required for completion/ commissioning.
- The Tenderer shall give complete technical specification of the equipment / items offered and general arrangement and schematic drawings for the approval of DPA or their representatives, sufficiently in advance of the commencement of manufacture. Such approval, when accorded, shall however, not relieve the Tenderer of his responsibilities towards satisfactory and trouble free performance of the installations. It is the responsibility of the Tenderer to submit the documents, drawings, data sheets etc. in proper order and getting them approved by Employer after incorporating comments, if any.
- All the equipment / items shall be shop tested according to the relevant standards. The particulars of the proposed tests shall be submitted to for approval before conducting the tests their representative shall be given full access to all the tests. The supplier shall inform DPA sufficiently in advance so that if DPA desire, their representative can witness the tests. All the certificates shall be submitted for the approval of DPA before clearance for dispatch of the equipment can be given.
- The Tenderer shall furnish to DPA the complete drawings, documents, test certificates, etc. as indicated in this technical specification for approval / information and record.
- Detail scope of work has been elaborated in the subsequent sections of the tender document

The Tenderer shall visit the site and analyze the condition etc before submitting the offer. Anything not covered in this specification but essential for proper installation, operation and maintenance shall be included by the Tenderer in his offer.



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The system shall be designed as per OISD-156 Guidelines. Anything not specifically mentioned in this Tender, but required as per OISD, TAC, NFPA guidelines shall be in the scope of the bidder.

### 1.2.1 Implementation Philosophy

This package shall be executed on a lump-sum Turnkey basis.

The scope of work of Tenderer also covers all such supplies and / or services which are required to ensure completeness of the supply and successful integrated safe operation of system planned in this specification.

### 1.3 Intent of the Specification

1.3.1 The specification for the tender shall be read in conjunction with the following documents irrespective of whether attention to the same has been specifically drawn or not:

- Notice Inviting Tender
- Other documents as referred in the various chapters of the specification.

### Order of Precedence

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed below (**i.e. SCC will prevail over GCC and TS will prevail over GTS**):

- (a) Special Conditions of Contract and Appendices hereto
- (b) General Conditions of Contract and Annexures hereto
- (c) Technical Specifications
- (d) General Technical Specifications

### 1.4 INSTRUCTION TO TENDERERS

1.4.1 The Tenderer shall study the specification and satisfy himself thoroughly and understand proper implementation methodology of the project.

1.4.2 The Tenderer shall ascertain himself by a visit to the site, the actual site conditions, local factors etc. before submitting his offer, and no extra claim on account of site conditions & local factors is admissible during execution of contract.

1.4.3 The Tenderer shall confirm that any damage done to the any existing structure carried out by other Tenderer/agency during execution of works will be made good by him without any extra cost implication.

1.4.4 Makes of all equipment, items shall be as per the list of preferred makes indicated elsewhere in this specification.





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1.4.5 All items of project shall comply with the latest regulations and stipulations of the applicable statutory bodies of Govt. of India and Gujarat whenever applicable for designing, installation, removal and commissioning. It is the responsibility of Successful Tenderer to satisfy the relevant authorities and obtain clearances from statutory authorities and other concerned agencies. All costs in these accounts shall be borne by the Tenderer. Statutory bodies shall include but not limited to the following:

- (i) Indian Standards published by the Bureau of Indian Standards.
- (ii) Publication in Control of Pollution in industries in Gujarat.
- (iii) Indian Boiler Regulation.
- (iv) Indian Explosive Act.
- (v) Indian Factory Act and Factory Rules of the State.
- (vi) Indian Electricity Rules.
- (vii) Model Codes of Safety regulations for industrial Establishments issued by International Labour Organization (ILO).
- (viii) Gazette of Ministry of Environment & Forest – Latest revision published by Government of India.
- (ix) Tariff Advisory Committee (TAC).
- (x) PESO
- (xi) OISD
- (xii) Any other relevant/standards.

1.4.6 The Tenderer shall study the General Technical Specification and confirm the acceptance of the same.

1.4.7 Workmanship and material shall be of good quality suitable for purpose intended and in accordance with highest standards and practices for equipment of class covered by the specification.

1.4.8 All equipment as required shall be suitably earthed.

1.4.9 Lifting lugs shall be provided in the equipment wherever necessary for maintenance/erection.

#### **1.4.10 Tools & Tackles**

All special tools and tackles, as required for normal operation and maintenance of the equipment are included in the scope of work of Tenderer.

#### **1.4.11 Drawings & Documents**



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These shall be as per requirement of this Specification (as specified elsewhere) and Special Instructions to Tenderer.

#### **1.4.12 Inspection & Testing**

1.4.12.1 Plant and Equipment shall be inspected stage wise by DPA/ TPI in accordance with tests indicated by Tenderer in Consultant Standard /approved QAP.

1.4.12.2 Inspection and approval at any stage of manufacture/ fabrication shall not absolve the Tenderer/ manufacturer/ fabricator of his responsibility for the supply of finished equipment to meet specifications. Equipment or parts thereof materials and weld joints found to have defects, improper fabrication, excessive repairs or not meeting the requirements of the specification shall be subject to rejection even if such conditions are discovered after acceptance at manufacturer's shop.

1.4.12.3 These shall be as per requirement of this Specification (as specified elsewhere) and Special Instructions to Tenderer.

1.4.13 All drawings /documents, designs, calculations etc. supplied by the Tenderer under the contract shall remain the property of DPA who shall have the right to use them for future projects or procurement without any additional cost reference to Tenderer.

1.4.14 Tenderer shall keep the site reasonably clean during execution of jobs from all unnecessary obstruction, store or remove any surplus material clear away any wreckage, rubbish or temporary works from the site and remove any Tenderer's equipment no longer required for execution of the contract. After completion of the work the Tenderer will hand over clear site devoid of all debris, unused material etc. to the satisfaction of DPA.

1.4.15 In case DPA's any equipment/ facilities (other than those which are under Tenderer's scope) are damaged during execution of work, the same shall be repaired/ restored to earlier condition by the Tenderer at no extra cost to DPA.

1.4.16 Tenderer shall provide adequate equipment and tools & tackles like earth moving equipment, cranes, winch derrick, chain pulley blocks, welding sets, jacks, gas cutting sets, gas regulators, grinding wheel etc. for smooth working at site. Any short fall in above shall be made good, if pointed out by site engineer.

#### **1.4.17 Painting**

1.4.17.1 All the equipment shall be thoroughly cleaned and freed from rust and scale. Surface preparation and painting shall be done in accordance with specification for Painting.

1.4.17.2 Shop painted equipment/items shall be touched up as required after erection as per painting done by the supplier of these items.

1.4.17.3 Technical specification for various items shall also be referred for special painting requirement.

1.4.18 Deleted



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#### 1.4.18.1 Deleted

1.4.18.2 Within thirty (30) days of the award of work or prior to the kick-off meeting, whichever is earlier, the Tenderer shall provide DPA with the detailed Bar chart diagram as mentioned above and after work has started, issue updated statements on the progress and/ or completion of the listed activities on a weekly basis. The Tenderer shall also deliver on a monthly basis to the DPA an updated Bar chart diagram showing changes in project status as of the end of the previous month. This diagram shall be delivered on or before the 5th of each month.

1.4.18.3 The Tenderer shall provide additional effort wherever the scheduling shown on the Bar chart diagram indicates a possible delay in the completion date. Such additional effort may require an increased deployment of equipment and/ or personnel working in 3 shifts. All extra costs including cost towards proper lighting for working in 3 shifts incurred by the Tenderer in order to prevent a possible delay in the completion date will be to the Tenderer's account.

1.4.18.4 The Tenderer shall notify DPA within twenty four (24) hours of any occurrence, which may adversely affect the completion date of the project. The Tenderer shall also notify the DPA, at least once in every week, the status of critical items, which could affect the completion date of project. In addition, the Tenderer shall include a statement of proposed remedial action for expediting these items.

1.4.18.5 Tenderer shall note that work is to be carried out without affecting the operation of the jetty works and take clearance from different departments of DPA and any other department/ authority prior to the commencement of work. Tenderer shall take into account that being running port clearance for work permit shall be given in piece meal depending upon the availability of front.

1.4.18.6 Tenderer shall submit a detailed plan and execution methodology for Installation of Fire protection system for jetty.

#### 1.4.19 Progress Report

1.4.19.1 The Tenderer shall guarantee adherence to the time schedule failing which the DPA shall have the liberty to cancel the order at any stage. The Tenderer shall furnish Bar chart for DPA's approval.

1.4.19.2 The Tenderer shall submit regular progress report on monthly basis. The formats and schedules of submission shall be mutually discussed and agreed.

1.4.20 The Tenderer shall provide all necessary superintendence during the execution of the works by appointing suitable number of qualified Engineers and staff as approved by Consultant/DPA and for so long thereafter as is considered necessary for the proper fulfillment of the Tenderer's obligations under the contract. The Tenderer shall depute competent and authorized engineer/staff or representative of the Tenderer approved in writing by DPA/Consultant (which approval may at any time be withdrawn) is to be constantly on the works to ensure proper performance of quality of work and shall give his whole time to superintendence of the same. If such approval is withdrawn, the Tenderer shall as soon as is practicable (having regard to the requirement of replacing him hereinafter mentioned) after



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receiving written notice of such withdrawal, remove the representative/staff from the site and shall not there after employ him in any capacity whatsoever and shall replace him by another staff/representative who shall receive on behalf of Tenderer directions and instructions from DPA/Consultant.

#### **1.4.21 Special instruction to Tenderer**

1.4.21.1 Tenderer shall undertake site visit prior to submission of bid. The tenderer shall confirm in the offer that "Site visit has been undertaken by him to understand the working conditions prevailing at site. No extra claim will be applicable on account of site conditions."

1.4.21.2 Area for locating Site fabrication yard will be provided by DPA free of cost outside the Oil Jetty area subject to availability otherwise the contractor has make own arrangements for the same at his own cost. All the debris, cleaning of grass/tree, area development work to be done by EPC contractor.

1.4.21.3 Communication inside the port shall be done through Walkie-Talkie. Contractor will arrange the required no of walkie-talkie for their representative and the same model suitable number shall be provided for Employer & for consultant also to be provided by EPC contractor till the completion of the project. Any repair for walkie-talkie and changing of batteries is to be done by Tenderer.

1.4.21.4 Two nos. of AC porta cabin (01 no for Employer +01 no for Consultant) along with 03 number of latest Computers, Study table and chairs are to be arranged by EPC contractor at site (Excluding Operation and Maintenance period).

1.4.21.5 The contractor has to deploy two nos. of Electric MUV vehicle of suitable make (Make-BYD/ MG/ KM/ HM/ TM) with the approval of EIC for transportation, supervision, inspection & monitoring of the SITC & O&M works at the site area by the DPA officials with minimum range of 350 kms in one charging and average running kilometer of 3000 kms per month basis per each vehicle including cost of charging, maintenance, driver costs etc. inclusive of all cost, which is to be borne by the contractor only. Alternately, during SITC period only, the contractor may deploy fuel operated MUV vehicle fitted with certified Spark arrestor for the purpose with average running kilometer of 3000 kms per month basis per each vehicle including cost of fuel, maintenance, driver costs etc. inclusive of all cost. In case the contractor does not provide the vehicle the employer will engage the other similar vehicle and the actual expense incurred will be recovered from their due payments or Rs. 2500/- per day will be recovered.

The successful Tenderer shall provide two sets of latest model, duly activated Mobile Phones or as specified in TIS, to the Employer for use of Employer's representatives to remain in contact with the work site, construction yards of the successful Tenderer. This service shall be made available within 14 days of receipt of Notification of Award. The amount of Monthly liability in normal circumstances shall not exceed Rs.1000/- per phone or as specified in TIS. The handset etc., shall be returned not later than 14 days from the date of release of Performance Guarantee in as is where is condition.

1.4.21.6 Portable Bio Toilet arrangement near the Jetty area to be provided by EPC contractor for the duration of project.



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1.4.21.7 Demolished Civil material to be dumped in designated dump yard within lead of 12-15 km.

1.4.21.8 Contractor shall deposit all the Dismantle Pipe/Structure, equipments, accessories or any other materials and the same shall be deposited at DPA store yard or as directed by the Engineer-in-charge at his own cost (if any).

1.4.21.9 Land for Labor camp shall be provided with in DPA land on chargeable basis as per prevailing rate of DPA subject to availability otherwise the contractor has make own arrangements for the same at his own cost

#### **1.4.22 Spares and Special Tools**

1.4.22.1 Supply of any commissioning spares as & when required for successful commissioning of the plant and equipment shall be in the scope of supply of the Tenderer along with the equipment. These items shall be based on the Tenderer's experience in commissioning similar plants in the past. However, Tenderer has to furnish a list of major commissioning spares, to be supplied along with equipment in its offer. The successful Tenderer shall be responsible for having the required items at site in sufficient quantities to take care of commissioning requirement. The Tenderer shall cover requirement of erection, cold tests, startup, testing & successful commissioning. Any leftover commissioning spares shall be the property of the DPA. Any commissioning spares required over and above the list given by the Tenderer shall have to be provided by the Tenderer free of cost up to the successful commissioning.

1.4.22.2 Tenderer has to furnish a list of major commissioning spares, to be supplied in its offer.

1.4.22.3 The Contractor shall include all spares, all consumables such as fill of lubricants, fuels, oils, grease, chemicals, tools, tackles and other accessories required for the commissioning, operation and maintenance of the Facilities, for a period of five (Five) years after commissioning of all pipelines and entire fire protection system and also the facilities installed by the contractor.

1.4.22.4 VOID.

1.4.22.5 The Tenderer shall also furnish Indian equivalent of oils, lubricants and other consumables as required along with necessary specifications, drawings, catalogues etc. to enable the DPA to procure them from indigenous sources.

1.4.22.6 Spares and consumable in O&M manual of the equipment shall be complete of the replaceable parts, fully illustrated shall be supplied. The list shall include the following broad information.

- Item designation
- Reference drawings
- Quantity installed
- Quantity recommended for five years' operation and Maintenance including the insurance spares
- Supplier or sub-supplier's catalogue number



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- Recommended minimum stock
- Expected replacement time
- Installation instruction in detail shall be supplied both for original installation and future, for replacement of major electrical equipment, circuit wiring diagram shall be provided.

Supply of special tools, tackles and other accessories required for erection, commissioning and operation facilities installed by the contractor and its associated systems. Tenderer shall furnish a list in its offer for the same.

## **2. CONSTRUCTION WATER**

2.1 The Tenderer will have to make his own arrangements for water required for and during construction, testing, flushing etc. However, if available, DPA may supply construction water at one point on chargeable basis as per prevailing rate of DPA. No delay or extra charges for making arrangement for construction water will be admissible on account of non-supply of the same by the DPA.

2.2 Seawater shall not be used as construction water or for testing of pipelines.

2.3 Drinking water facility for Workers to be arranged by EPC contractor

## **3. CONSTRUCTION POWER**

3.1 The Construction Power to be arranged by Contractor at His Own Cost. However, if available then at One-point power shall be provided by DPA on Chargeable basis as per prevailing rate of applicable tariff and further No delay on account of providing electricity shall be considered. A power supply source at substation shall be provided to the contractor at his own risk & cost. The required Main Incoming Cable from nearest sub-station to the Main MCC panel, and the power cable distribution for firefighting system from MCC Panel shall be in the scope of the contractor. Contractor has to arrange the route for cabling for the operation of complete firefighting system. During Operation and Maintenance period electricity power will be provided by Deendayal Port Authority free of cost. However, all the arrangement for tapping the source of electricity at convenient point & install metering system shall be made by the contractor at his own risk & cost. No delay or extra charges for making arrangement for construction Power will be admissible on account of non-supply of the same by the DPA.

3.2 The Tenderer shall ensure that the electrical equipment employed are such that the aggregate power factor does not fall below 0.8 at the DPA's terminal point.

3.3 The Tenderer shall obtain DPA's prior approval of the location of Tenderer's fixed construction machinery and the points for tapping of electrical supply, laying of distribution lines and wiring.

3.4 The Tenderer shall supply and install switches, fuse units of suitable rated capacity separately for power and lighting on a frame preferable of steel and provide rain water protection cover on the switches. The installation shall be made as per relevant rules.





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3.5 Display of danger board signs in Hindi, English & Regional languages near switches, Distribution boards, substations is to be ensured by the Tenderer.

3.6 The Tenderer shall supply and install all distribution cables, wires etc. of the rated capacity for the work starting from the source of power at his own cost. He shall employ electricians having valid electrical license for carrying out the installations as well as for the maintenance works.

3.7 The Tenderer shall provide proper facilities to DPA or his authorized representatives for inspecting his temporary electrical installations as and when required. The Tenderer shall immediately attend to the defects so pointed out during this inspection including replacement of faulty cable, switches, boards etc.

3.8 The Tenderer shall not affect any changes in the temporary installations unless permission is obtained from the DPA or his authorized representatives.

3.9 The Tenderer shall be responsible for all damages, losses etc. due to fire or due to his negligence by improper installation, operation and/or maintenance of his part of installations.

3.10 The Tenderer shall make his own arrangements for alternative source of power in case of unavoidable failure of supply.

## **4.0 TECHNOLOGICAL**

### **4.1 INTRODUCTION**

The intent of this technical specification covers basic & detailed design as per broad technical specification of tender, engineering, procurement of materials, fabrication / Assembly, shop testing, shop painting, packing, loading, transportation to plant / site, unloading, storage at site, watch & ward, unpacking, transportation to erection site, handling at site, erection, site testing, site painting, commissioning of complete works as specified herein along with Firefighting works, Piping, Civil & Structural Works, Electrical, Instrumentation works etc. as described in subsequent clauses & chapters.

This chapter establishes the scope and schedule for the work to be performed by the EPC contractor and describes the guidelines, instructions etc., which the EPC shall satisfy or adhere to in the performance of the work. Basic Engineering & Front End Engineering Design (FEED) for the above facility to establish the system requirements considering entire life of the field including the process description, basic scheme of the system have already been prepared by Consultant/DPA. EPC Contractor is required to adhere to the specified scheme, carry out the site visit and check the feasibility of the scheme in accordance with OISD code/other applicable Codes & standards. Any Deviation in the specified parameters suggested by contractor shall be substantiated with documentary evidence / calculations for review by Consultant/DPA.

### **4.2 SCOPE OF EPC:**

Deendayal Port requires the services of EPC (Engineering, Procurement and Construction) contractor to provide Fire Protection system at Oil Jetty 8 area at Kandla in accordance with



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Terms of Reference. This section establishes the indicative scope and schedule for the work to be performed by the EPC and describes the guidelines, instructions etc., which the EPC shall satisfy or adhere to in the performance of the work. The Indicative Work Envisaged for Design, Supply, Erect, Install, Commissioning and operation & Maintenance of Firefighting at Oil Jetty No. 08 Area, Kandla, Gujarat covering different disciplines has been given below to facilitate the EPC to understand the work requirement.

The EPC shall design the facilities based on current practice followed in Port industry and in consideration of the statutory regulations like OISD (Oil Industry Safety Directorate), Ministry of Environmental & Forests (MOEF), Central Water & Power research station, Controller of Explosives, Ministry of surface Transport, Central Electricity Authority (CEA), PESO (Petroleum & Explosives Safety Organization), Board of Trustees of Deendayal Port Authority, Tariff Advisory committee, Relevant port Authority, Director General of Technical Development/ Director General of Foreign Trade, Government of Gujarat, Department of Irrigation GoG /Relevant Authority, Gujarat Water Supply and Sewerage Board (GWSSB), Gujarat Pollution Control Board (GPCB), Gujarat Electricity Board ( GEB), Chief Inspector of Factories , GoG, Labor Commissioner and any other relevant laws, by-laws or Acts in force.

The brief scope of EPC are Pre-Engineering Survey, Detailed design/ engineering, Procurement, Manufacturing & Delivery, Fabrication and supply, site grading and levelling, Construction (Civil and Structural), Transportation, Erection / Installation, Piping, Hook-ups to the systems, Painting, Instrumentation, Electrical works, Testing, Pre-commissioning and Commissioning after successful completion of Performance Guarantee Test Run (PGTR) of the total System on Lump sum Turn Key Basis(LSTK) including supply of mandatory spares. After successful PG test, Bidder shall operate & maintain the system for 5 Years before handing over to DPA.

It is not the intent to completely specify all the details of design and construction, nevertheless the unit shall conform in all respects to high standards of design, engineering and workmanship. Any piece of unit or equipment not specifically mentioned in this specification, but required to make the unit complete, safe, operable and consistent with good engineering practices and applicable standards like OISD, PESO, TAC, NFPA shall be provided by the contractor at no extra cost and shall be deemed to have specified. EPC Contractor shall prepare the detailed document control index / document schedule based on the respective Job Specifications for the complete project and submit the same during Kick-Off meeting as first document for DPA/Consultant review. Any additions to this document during the progress of the project by DPA/ Consultant shall be taken care of by the EPC contractor without cost / time implications. Document submission shall be strictly as per this Index.

The mentioned scope of work is only indicative, but not limited. However, the Contractor has to ensure completeness of the Fire-fighting Project in all aspects to the satisfaction of the Statutory requirements viz., OISD-156, PESO and Employer by following all the latest Amendments, Specifications, Codes and Standards.

It should be noted by the bidders that the information, size, specifications, & dimensions mentioned in this document are indicative only. As in Turnkey Contracts, the successful bidder shall workout detail drawings during detail engineering stage meeting the functional




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requirements & relevant IS standards, well within the sanctioned estimate, and submit the fresh drawings for approval to employer & PESO as per OISD-156 standard.

### **BRIEF INDICATIVE SCOPE OF WORK**

SL. NO.	LOCATION	SCOPE OF WORK
1.	Oil Jetty 8	<ul style="list-style-type: none"> <li>• Fire water pumps Vertical turbine FM/UL Diesel Engine Pumps capacity 820 cu.m/hr Head 160m (Minimum) Vertical turbine FM/UL Electrical Motor driven Pumps capacity 820 cu.m/hr Head 160m (Minimum) Jockey Pumps 210 cu.m/hr (Minimum)</li> <li>• 4 Water cum Foam Tower Monitors of capacity 2000 GPM (7570 LPM each) which includes the Foam proportionate. All the structures, pipelines, controls and all other components shall be provided with flame proof cables, fire proof and painting with cement lining.</li> <li>• 4 (minimum no's) Jumbo water curtain Nozzles of capacity 6000 LPM (Each). However, the contractor has to ensure Water flow for area segregation by providing jumbo water curtains between ship tanker and loading / unloading arms and Hydrant service to cover the water spread area on the entire jetty head</li> <li>• Foam Pumps and Foam tank of capacity 28 KL</li> <li>• Fire water distribution network</li> <li>• Foam compound distribution network</li> <li>• Fixed water spray system</li> <li>• Two International Shore Fire Connection (IFSC)</li> <li>• Double Hydrants</li> <li>• Ground Water cum foam monitors which includes the Foam proportionate.</li> <li>• Portable &amp; Wheeled fire Extinguishers.</li> <li>• Safety Equipment in Fire Station.</li> <li>• First Aid Fire Fighting Equipment</li> <li>• Fire Detection, smoke detection, gas detection Alarm &amp; Communication System.</li> <li>• Suitable number of Flameproof CCTV</li> <li>• Clean Agent/ CO2 system at Control Room</li> <li>• Fire Pump Co-ordination Panel</li> <li>• Diesel tank for the Pumps and accessories shall be provided separately with suitable partition as directed by EIC</li> <li>• Hand railing</li> <li>• Fixed water and foam facilities spray system at Manifold</li> <li>• All the facilities installed on jetty by the EPC contractor shall be remote operated from control room in addition to remote operation from field control panel located in safe area.</li> </ul> <p>All civil work concreting shall be done by minimum M35 or as</p>

 <p>DEENDAYAL PORT AUTHORITY</p>	<p><b>Project Title:</b> Design, Supply, Installation, Testing &amp; Commissioning of Fire-fighting system and associated facilities including Operation &amp; Maintenance for a period of five years as per OISD-156 at Oil Jetty No. 08, Kandla, of Deendayal Port Authority</p> <p><b>Document Title:</b> Vol II of III Employers Requirements and Annual Operation &amp; Maintenance Contract</p>
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	directed by EIC
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#### Note-

- The above scope of work is only indicative, but not limited. However, the Contractor has to ensure to complete the Project in all aspects to the satisfaction of the Employer by following all the latest Amendments, Specifications, Codes and Standards.
- The scope of work specified in the above table are minimum requirements. Any piece of unit or equipment not specifically mentioned in the table, but required as per OISD guidelines shall be provided by the contractor at no extra cost and shall be deemed to have been specified.
- EPC contractor has to visit the site for actual quantification of the proposed job and quantum of the job.
- Contractor shall carry out site visit for complete understanding of the scope of work before submission of the bid. (Site visit certificate mandatory otherwise bidder is treated as non responsive and the bid will be rejected)
- All the cables, steel structures and all the other components at the jetty area & Manifold area shall be provided with flame proof cables, fire proof and painting with cement lining shall be provided.
- QRA (Quantitative Risk Assessment) shall be carried out before commencement of the work as directed by EIC.
- The contractor has to integrate the pipeline network along with allied accessories from the discharge flange/point of the respective pump.
- In case of any wear & tear, worn out, failure of pipelines, components or any facility installed by the contractor, the contractor has to replace the same in total till to original working condition and no patch shall be allowed.
- All the valves may be gate valves wherever required as per the design.
- Supply, installation of diesel tank shall be suitably provided near the pump house as directed EIC.

#### 4.2.1 Deleted

#### 4.2.2 DETAIL ENGINEERING:

The Contractor should carry out design of new pipelines and facilities as detailed below:

- Contractor shall carry out detail engineering, procurement & Construction of proposed work. The Contractor shall carry out any other engineering, procurement, construction etc., over and above of that mentioned in the guidelines, required to complete the project with no extra cost to the Company. All such activities shall be vetted by Consultant /DPA.
- Detail Design/ Engineering shall include preparation of Piping drawing, General arrangement, Plan & Elevation drawing etc. EPC contractor will develop Detailed Engineering as per Consultant's guidelines. Detailed Engineering phase shall include submission of HSE plan and Quality assurance plan, both specific to this project, procurement support, fabrication drawings,



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construction drawings for foundation, steel frame, construction drawings for electrical equipment, instrumentation and piping, vents/drains, Hook ups, Loops, vendor data etc.

3. All detailed Engineering, piping, Civil, Structural, Mechanical, Electrical and Instrumentation etc. which forms a part of the Project shall be approved by the Consultant. Construction work shall only be carried out based on Issued for Construction (IFC) drawings released by the Consultant/ DPA.

4. Inspection and expediting services.

5. Construction supervision and assistance in project management.

6. Ensure quality control and safety of operation and certify the jobs executed

7. Ensure adherence to statutory guidelines followed in Port Industry

8. Provide statutory approvals for individual equipment /instrument.

9. Ensure that all equipment's / instruments have statutory approvals as required by concerned authority for installation in Hazardous area.

10. Finalization & completion of as built drawing by EPC contractor with Consultant's approval and submission to DPT.

11. Submission of list of BOM (Bill of materials) in soft and hard form against all materials & equipment's installed at the Port along with quantities, manufacturer details, technical specifications etc.

12. Pre-commissioning of individual pipelines and equipment and submission of commission report to Consultant/DPA.

#### **4.2.3 PROCUREMENT**

The scope of work of this Contract is composite in nature which contains broadly:

a) All materials required for successful completion of this project shall be procured by the contractor from approved vendors/suppliers or from the vendors with specific approval from Consultant/DPA. It is mandatory that all equipment, machines and bulk materials are procured only from recommended approved vendor list of the package in "VENDOR LIST". In case vendor list of a particular item is not available, the contractor shall specifically seek Consultant/DPA approval on the proposed list of vendors before procurement of the respective item.

b) All materials including equipment (fixed and Rotary, pipes of different dia. and length, valves, pipe fittings, all structures, structural platforms / ladders, stairs, supports electrical items, instrumentation items, paints etc. within the specified battery limits etc. will be procured and transported to project site by EPC Contractor.

c) Pipe quantity is to be considered as per site requirement.



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d) Unloading at site, Safe storage at project site and site transportation are under scope of EPC contractor.

#### **4.2.4 MECHANICAL ENGINEERING TERMS AND CONDITIONS**

The technical requirement shall be as per technical specifications attached as part of the tender document.

##### **4.2.4.1 EQUIPMENT ENGINEERING:**

It will include but not limited to:

4.2.4.1.1 Preparation of drawings, documents, defining major equipment, giving the layout of equipment with sections and elevations, wherever necessary for equipment engineering as per the statutory guidelines followed in port industry.

4.2.4.1.2 Provide specifications / standards for all equipment and machinery to be procured as part of turnkey supply considering system and statutory requirements.

4.2.4.1.3 Finalize agreed specification / standards for equipment/machinery to be incorporated in the contract of turnkey supplier in consultation with Consultant/DPA.

4.2.4.1.4 Review/ approval of drawings/documents of turnkey supplier during execution as necessary & obtaining from Consultant/DPA approval.

##### **The job involves the following:**

i. The fabrication of module structures and pre-fabrication of piping spools shall be carried out at EPC contractor fabrication yard. All pressure parts shall be subjected to required non-destructive examinations and hydro test.

ii. Safe and quality installation of modules, pumps, filters in different foundations to the satisfaction of Consultant/DPA shall be performed by the contractor.

iii. The contractor will have to supply all materials including pipes, valves, pipe fittings, and support structures etc.

##### **4.2.4.2 PROCESS PIPING ENGINEERING:**

It will include but not limited to:

4.2.4.2.1 Stress analysis as required for critical piping.

4.2.4.2.2 Detailed Design of all equipment like strainer, instrumentation control and monitoring, electrics and illumination etc. required for the proposed system.

4.2.4.2.3 Preparation of detailed technical specifications including data sheets, tender drawings, basic layout, GAD, estimated quantities of execution for various contracts including civil, structural, equipment, piping, P&ID, PFD, electrical, instrumentation as required for the process and statutory guidelines.





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4.2.4.2.4 Submission of all documents for Review/approval of DPA/Consultant with respect to engineering performed and statutory requirement.

**The job involves the following:**

Piping fabrication, welding of different diameters and thickness of pipes, installation of pipe fittings, valves, expanders/ reducers, radiography of welding joints, surface cleaning, primer coating, painting (incl. colour code), hydro testing and complete the whole piping network to the satisfaction of DPA/Consultant and commissioned the whole system in conjunction with DPA/Consultant. The piping system should be self-sufficient, self-contained and zero leak to the environment. All the jobs should be carried out with strict adherence to all the ASME specifications as well as safety rules and regulations prevailing in upstream oil company.

**4.2.5 GENERAL GUIDELINES FOR FABRICATION AND ERECTION:**

i. The contractor shall submit the method statement for the erection of pipeline before commencing the construction and Installation sequence before commencing the Erection/ installation. The entire job shall be carried out under constant supervision of contractor's experienced and qualified personnel.

ii. The electrodes used shall be of suitable gauge and specification and will be approved by the Consultant engineer. Prior to starting of erection job, once approved, change of electrodes will not be allowed during the process of welding. All necessary alignment and end preparation of the pipes shall be done prior to welding.

iii. Welding shall be of radiographic quality conforming to the required specification. The welding joints will be subjected to random radiographic test in accordance with requirement. 10% radiographic test is to be performed.

vi. The welders engaged for the job must have sufficient experience in similar jobs to ensure proper quality of welding. Prior to engagement, all welders will be subjected to tests by Consultant and only the approved welders will be allowed to carry out welding jobs.

v. The contractor shall supply all pipes of tested quality conforming to piping material specification as per the standard specifications including for welder test, labour, machineries, equipment, consumables etc. required for complete fabrication and erection work.

vi. Materials supplied by the contractor will be inspected / tested by EPC deputed TPI agency and only the approved materials will be allowed to use. Rejected materials will be replaced at contractors cost. Similarly repairs to any pipes / materials will be borne by the contractor.

vii. Transportation of all materials including loading and unloading; fabrication and installation of all piping works; final alignment of equipment after placing of foundations; fabrication and installation of manifolds, supports, walkways, various sheds etc.; laying of electrical cables; providing earthing system to piping system; execution of other electrical engineering jobs, execution of various civil engineering jobs; painting of all pipe fittings, piping & vessels; hooking up of all equipment /piping etc. including relevant hydraulic tests, shall be the scope of the contractor.



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viii. Water supply, security, Electrical powers for the welding /grinding & for running other machineries during the construction phase are to be arranged by Contractor. The job will be normally carried out in the day hours only. However, in case of urgency company may consider to allow the contractor to carry out the jobs in the night hours if the proper illumination at work site is arranged by the contractor at their own cost.

ix. Structural guide supports & half sleeve welding in bottom of pipeline shall be provided at each structural & sleeper supports as per attached tender drawing,

#### **4.2.6 INSPECTION AND TESTING:**

Detailed quality control Plan (Inspection Test Plan) shall be submitted to DPA/ Consultant for approval before starting the fabrication work. **All inspections / tests / Certificates shall have approval of Consultant.**

##### **4.2.6.1 Inspection & Testing of materials:**

a) The DPA/ Consultant shall be entitled at all times at the risk of the contractor to inspect and/ or test by itself including radiographic test or through an independent person(s) or agency (ies) appointed by the company and/ or to direct the contractor to inspect and/ or test all materials, items and components whatsoever supplied or proposed for supply for incorporation in the works, inclusive, during the course of manufacture or fabrication by the contractor and/ or at the contractor's works or otherwise the inspection and/ or test shall be conducted at the expense of the contractor and if conducted by the contractor may be directed by the company to be conducted by the agency(ies) nominated by the company and/ or in the presence of a witness(es) or agency (ies) nominated by the DPA/ Consultant.

b) The site engineer shall be entitled to reject at any time any defective material, item or component (including specially manufactured or fabricated items or components) supplied by the contractor for incorporation in the works notwithstanding previous inspection and/ or testing thereof by or on behalf of the Company without rejection and notwithstanding previous approval thereof by or on behalf of the DPA the decision of the site engineer as to any defect as aforesaid being final and binding upon the contractor and upon such rejection the contractor shall perform such work as shall be necessary to bring the material/ item/ component to the requisite standard or shall if so required by the site Engineer (whose decision in this behalf shall be final) remove the rejected material/item/ components from the job site within the time specified by the site engineer and replace it at his own cost and expense with material(s)/ item(s) component(s) approved by the site engineer.

##### **4.2.6.2 Inspection & Testing of works:**

a. The contractor shall at all times ensure high standard of workmanship, related to the work to the satisfaction of the site engineer. The site engineer shall have the power to inspect the work in all respects at any and all times up to the completion of the work as also to test or instruct the contractor to test the works or any structure, material(s) or component(s) thereof at the risk and cost of the contractor.



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b. The contractor shall provide all facilities, instruments, materials/ labours etc. required for testing of the works and shall provide the site engineer all assistance necessary to inspect the tests carried out by the contractor.

c. The contractor shall also provide and keep at all times during the progress of the work, proper means of access to the work and every part thereof by means of ladders, gangways etc. for inspection and measurement of the work.

d. Should the site engineer on inspection or test be not satisfied with the quality of workmanship, of any work, material or component (the decision of the site engineer being final in this behalf) the contractor shall re-perform, replace, re-install and/ or re-erect as the case may be such work, structure material or component and no such rejected work, structure, materials or item or component shall be re used with reference to the work except with the prior permission of the site engineer.

#### **4.2.6.3 Final test and possession of works:**

a. As soon as the works have been completed in all respects to the satisfaction of the site engineer, final tests of the works shall be undertaken by the contractor at the risk and costs of the contractor in the presence of the site engineer. The company may at its discretion permit final tests in piecemeal in respect of particular part(s) or sections(s) or group(s) of the works or in respect of particular job site(s) involved.

b. Upon satisfactory completion of the final tests, the site engineer shall prepare a final test certificate witnessed by the contractor, which shall certify the date on which the final tests in respect of the works have been successfully completed and where final tests have been conducted in piecemeal in respect of the concerned part(s)/ sections(s)/group(s)/ job site(s).

c. As and from the date of successful completion of final tests as mentioned in the final test certificate the Company shall be deemed to have taken over the work(s)/ part (s)/section(s)/ group(s), in respect of which final test certificate have been issued.

d. If during the Final Tests or prior thereto any defect(s) in any work performed or structure or component installed/erected or material or other items incorporated in the works is/ are noticed, the contractor shall forthwith remove and/or demolish the same and re-perform, replace, reinstall or re-erect the same and otherwise do and provide whatever is necessary to be done or provide to correct, repair and/ or rectify the defect(s) to the satisfaction of the site engineer.

#### **4.2.6.4 Inspection and testing of pipeline:**

a. Visual inspection- Finish weld shall be visually inspected for parallel and axial misalignment of the work, cracks, inadequate penetration, unrepaired burn through, dimension and other surface defects and it must present neat appearance.

b. The radiography of the welding joints would be carried out by an inspection agency approved by Consultant/DPA. The contractor shall make necessary arrangements and shall include the cost in the bid for the equipment as well as radiographic films.



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d. The procedure of radiographic examination, limits of acceptability, removal and repair of defects shall be approved by the Consultant / engineer in-charge. Cracks and lack of root fusion/ penetration are considered as injurious defects and shall not be permitted. Contractor shall be responsible for carrying out radiographic examinations of defects and re-radiography of the welds rectified. He/ she shall make necessary arrangements for the equipment as well as radiographic films at his own cost for the repairing of the defective welding joints.

e. Contractor shall fulfil all the statutory safety requirements in handling the X-Ray and Gamma rays equipment.

f. Joints to be radio graphed shall be selected by site engineer and the radiography shall be carried out in his presence. The contractor shall submit all the radiographs along with radiographic reports of the defective joints to the site engineer / engineer-in-charge immediately after processing the radiographs for approval. The details of the radiographs shall be duly recorded and signed by him in the radiographic reports.

Radiographic examination shall be carried out by approved agency arranged by the contractor at his cost.

Weld areas to be radio graphed shall be designated by the Engineer-in-charge or his representative. Overall 10% of the joints shall be radiographed.

Radiographs of the welds shall be taken as soon as the welding of joint is completed. If repairs are required they shall be carried out before continuing the other welds.

Repeat radiography due to contractors fault or additional radiography necessitated due to poor performance of contractor/welders shall be done at contractor's cost.

Welds found faulty as a result of radiographic, visual or other tests must be chipped off to the satisfaction of the Engineer-in-Charge or his representative and welded as per specifications and instructions. The welded portion shall be re-tested as per the instructions of the Engineer-in-Charge or his representative. No claims for compensation whatsoever shall be entertained on this account.

For each weld performed by a welder found unacceptable, two additional checks shall be carried out on welds performed by the same welder. This operation is iterative and that of the two additional welds for each weld deemed unsatisfactory shall be continued till such time that two consecutive welds of satisfactory quality are found for every defective weld.

The contractor shall carry out these additional radiographic testing at his own expense. To avoid the possibility of too many defective welds by a single welder remaining undetected for a long period to time, the contractor shall promptly arrange for radiographic examination so that there is no accumulation of defective joints.

#### **4.2.6.5 Pressure testing of piping:**

a. Soundness of the weld shall be tested by the contractor in the presence of site engineer by hydrostatic/ pneumatic means.



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b. Prior to test, installation shall be inspected by the site engineer to the extent necessary to ensure compliance with engineering design with respect to material, fabrication and assembly. The contractor shall obtain clearance for such tests from the site engineer.

c. Valves shall be tested individually before installation by the contractor at his own cost.

d. All piping including valves, flanges, fittings etc. shall be tested hydraulically to the recommended pressure (1.5 x design pressure) in presence of the site engineer. Necessary pump, tools, water & all other accessories for hydraulic testing shall be arranged by the contractor. Only pressure recorder & chart will be provided by the company. If the pressure does not hold good due to contractor's defect workmanships, the same shall be rectified & hydraulic testing shall be redone free of cost.

#### **4.2.7 REPAIRS OR REMOVAL OF DEFECTS:**

i. Defects that are not within the acceptable limits shall be removed from the joint completely by chipping or grinding.

ii. No repairs shall be carried out without prior approval of site engineer.

iii. All leaks detected during testing shall be repaired to the satisfaction of site engineer and on completion; the entire piping system shall be tight and free from leaks.

iv. After completion of all repairs piping section shall be retested as mentioned earlier

#### **4.2.8 CLEANING:**

i. All equipment in the system shall be cleaned and flushed free of all dirt, debris and loose foreign material after approval of pressure testing by the site engineer/ engineering-charge.

ii. Orifice plates and other similar restrictions shall not be installed in the piping system until flushing has been completed.

iii. Proper temporary drainage for flushing water shall be provided so that no damage is done to permanent facilities.

#### **4.2.9 PAINTING:**

i. Painting covers the general requirements like surface preparation, painting, application sequence, colour codes etc.

ii. Paint selected shall be such that they should be able to withstand all weather conditions as well as atmospheric conditions of the port area. Site Engineer shall approve all paints that are used for work.

iii. Anti-corrosive paints especially considering port environment condition for pipes should be taken into account while designing/ selecting the paint. 0.

iv. Painting of entire installation including, equipment, pipes, equipment sheds, structure and all other facilities in the installation.



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v. The Insulating material, Paint Material, Procedure of application, Selection etc. shall be approved by DPA/Consultant. The colour coding shall be as per standard colour code of DPA and instructions of site engineer.

4.3 Deleted

4.4 Deleted

#### **4.5 SAFETY NORMS DURING CONSTRUCTION:**

1. The contractor personnel shall abide by all relevant statutory safety and environment rules, regulations, applicable codes and standards (i.e. OISD standards etc.). It will be solely the Contractor's responsibility to fulfil all the legal formalities with respect to the Health, Safety and Environmental aspects of the entire job (namely; the person employed by him, the equipment, the environment, etc.) under the jurisdiction of the district of that state where it is operating.

2. Every person deployed by the contractor in the site must wear safety gadgets to be provided by the contractor. The Contractor shall provide proper Personnel Protective Equipment as per the hazard identified and risk assessed for the job and conforming to statutory requirement and company PPE schedule. Safety appliances like protective footwear, Safety Helmet and Full Body harness has to be concerned approved. Necessary supportive document shall have to be submitted as proof. If the Contractor fails to provide the safety items as mentioned above to the working personnel, the Contractor may apply to DPA for providing the same. DPA will provide the safety items, if available. But in turn, DPA will recover the actual cost of the items by deducting from Contractor's Bill. However, it will be the Contractor's sole responsibility to ensure that the persons engaged by him at the port use the proper PPE while at work. All the safety gears mentioned above are to be provided to the working personnel before commencement of the work.

3. The Contractor shall prepare written Standard Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them. The SOP should clearly state the risk arising to men, machineries & material from the port operation / operations to be done by the contractor and how it is to be managed.

4. While carrying out welding and cutting jobs, the contractor shall strictly enforce the guidelines as per port guideline.

5. Chain pulley block and other lifting equipment used for lifting shall be tested and should be of in good condition and certified by appropriate statutory authority

6. Supervising personal shall always be present at working spot during working hours.

7. All torches, regulators, cylinders and other equipment should be of an approved design of appropriate authority and in good conditions.

8. Necessary sign boards/ warning signals etc. should be used while working. The said sign boards/ warning signals shall have to be arranged by the contractor.

9. First aid box shall be provided by the contractor and same has to be kept ready at work site for contractor's personnel while carrying out the job.





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10. Under no circumstances LPG should be used for gas cutting purpose. .
11. The contractor's personnel have to take every possible care to keep the environment clean and free from pollution.
12. The contractor's personnel should understand the implication of the known hazards related to the work undertaken by them and the necessity of having an emergency plan ready to counter them.
13. While providing the services, the contractor personnel have to follow the procedures and systems taking all control measures in all the stages of works to avoid any untoward incidents/accidents.
14. Any compensation arising out of the job whether related to pollution matter, Safety or Health will be paid by the contractor only.
15. The contractor has to keep a register of the persons employed by him. The contractor's supervisor shall take and maintain attendance of his men every day for the work, punctually.
16. Any compensation arising out of the accident cases to contractor employees will be borne by the contractor.
17. In case Contractor is found non-compliant of HSE laws as required company will have the right for directing the contractor to take action to comply with the requirements, and for further noncompliance, the contractor will be penalized prevailing relevant Acts / Rules / Regulations.
18. The contractor should prevent the frequent change of his contractual employees as far as practicable.
19. In absence of a stipulated provision, sound industry practices shall guide the project execution work and operation & maintenance thereafter.

#### **4.6 STATUTORY APPROVALS:**

The contractor has to prepare engineering drawing of the plot plan, electrical single line diagram, schematic drawing of piping network and other drawings as deemed to be required for statutory approvals from Concerned Authority. All the drawings (detailed engineering), documents have to be prepared by the Contractor in a presentable manner and submit to Consultant for review and approval. The documents shall then be signed by Competent Authority of DPA. EPC shall submit the documents to Concerned Authority as applicable, and obtain the permission before commissioning of the system. No fees shall be provided by DPA.

**4.6.1** All items of project shall comply with the latest regulations and stipulations of the applicable statutory bodies of Govt. of India and Govt. of state of Gujarat as applicable for carrying out any activity connected with the project such as investigations, dismantling, designing, transportation of materials, storage, installation, testing and commissioning. It is the responsibility of Successful Tenderer to satisfy the relevant authorities and obtain clearances, approvals and certification from statutory authorities and other concerned agencies. All costs on these accounts will be part of EPC Contract and shall be borne by the EPC contractor. The Statutory bodies shall include but not limited to the following:



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- (i) Ministry of Environment and Forests (MOE&F)
- (ii) Central Pollution Control Board (CPCB) / Gujarat Pollution control Board (GPCB)
- (iii) Coastal Zone regulatory authority (CRZ authority)
- (iv) Petroleum and Explosives Safety Organization (PESO)
- (v) Oil Industry Safety Directorate (OISD)
- (vi) Chief Electrical Inspector of Govt of Gujarat / Central electricity authority
- (vii) Inspectorate of Factories- Government of Gujarat.
- (viii) Labour Commissionerate /Inspectorate administering Labour laws.
- (ix) Inspectorate of Boilers and pressure vessels.
- (x) Dock safety Inspectorate
- (xi) Gujarat Labor Welfare Board.
- (xii) Regional Fire officer
- (xiii) Any other authority relevant to the project or any part of it

#### **4.6.2 Statutory Approvals & Certifications:**

- The contractor has to arrange for Facility design & drawing Approval, Inspection & Certification from Petroleum and Explosive Safety Organization (PESO) as per OISD-156 latest amendment from PESO or its authorized agency. The complete fire protection system at Oil Jetty No. 08, Deendayal Port Authority as per OISD-156 will be only accepted after certification from PESO or its authorized agency. The certification shall be submitted to DPA before acceptance of the system.
- The contractor has to obtain Fire NOC from Regional Fire Officer, for the complete Firefighting system.
- Any other statutory clearance/ certification, if any, shall be in scope of the contractor.
- Risk Assessment studies, reports and Fees towards all such statutory clearance/ certification shall be initially borne by the contractor and same shall be reimbursed by DPA after submission of the request & on production of documentary evidence such as original receipt of such studies cost/ fees in name of "Deendayal Port Authority," for the facility only.

#### **Note:**

Initial permission from Concerned Authority (for consent to establish and till to approval) for setting up the whole system is in the scope of EPC contractor. EPC shall inform statutory authorities and obtain approval thereof from Concerned Authority (for consent to Operate) on completion of mechanical construction based on the revised drawings / as built drawings/detailed engineering drawings etc. The format for statutory forms shall be provided by the contractor.

The contractor has to arrange for facility drawing Approval, Inspection and certification from petroleum and explosive safety organization (PESO) as per the OISD-156 latest amendment from PESO authorized agency. The complete fire protection system to be installed at the jetty as per scope of work and as per OISD156 shall be inspected by agency having authorization from PESO. Authorization certificate shall be submitted to DPA before commencement of the work.



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Any other statutory clearance / certification if any shall be in the scope of the contractor.

The Contractor has to obtain certificate from PESO and all other statutory bodies after commissioning of all the facilities installed by the contractor in accordance to the OISD 156 STD latest.

#### 4.7 GENERAL

All possible efforts have been made to establish a link between the Basic Engineering Design Package, Scope of work, Design basis and philosophy, Job specifications, Standard Specifications, Standards and Drawings so that the contractor has clear cut frame work of guidelines within which the detailed engineering would be performed by him. Despite this, it may still be required to apply judgment and reason to certain areas based on experience and sound engineering practice to achieve desired results.

a) However, contractor must understand and undertake clearly that it is the sole responsibility of the contractor to complete all works in all respect leading to mechanical completion; commissioning and make the fire protection system ready for operation. Codes and standards included shall be used as guidance and considered as the minimum requirement. Due care shall be exercised such that the overall design provided ease of construction, installation, commissioning, start-up operation and maintenance and shall be safe to operate under all conditions.

b) In case of any conflicting requirement of various chapters, which are part of this document following order of priority shall govern in general. However, in case of conflict, it shall be referred to Consultant for clarifications and the decision of Consultant/DPA shall be final and binding on the contractor without any cost and time implications.

- Scope of work, Design basis and Job Specifications, Standards and Job Specific Drawings (Basic Engineering Package)
- Standard Specification
- National Codes
- International Codes

c) The requirement of any statutory body like OISD, PESO, Tariff Advisory Committee, Chief Controller of Explosive (CCE), Nagpur, India, Environmental Clearances, Factory Inspectorate shall govern where these are more stringent than the requirement specified above.

d) It is contractor's responsibility to make site visit and familiarize with site conditions with respect of the exact size, layout, location, access, transport problem to site, site storage and availability of construction water, power etc. for construction of the proposed project. No consideration on account of unfamiliarity with actual site condition shall be entertained after award of contract.

k) Contractor shall submit updated discipline-wise drawing index fortnightly, so that the error in construction on previous revision could be avoided. Construction shall not be carried out with advance revision, not reviewed by Engineering Consultant.



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#### **4.8 OTHER RESPONSIBILITIES:**

4.8.1 Contractor shall also ensure that equipment suppliers provide all maintenance spares for at least first five (05) years of operation.

4.8.2 The Contractor will make necessary documentation in prescribed formats for statutory approvals. The Contractor must ensure that all the statutory approval/certificates are obtained before commissioning of the piping system is deemed to be completed.

4.8.3 Contractor will depute competent persons to carry out detail engineering, procurement and construction activities for the project.

4.8.4 Contractor's personnel shall execute construction, erection and installation of the complete system as detailed above to ensure soundness of erection and installation by providing adequate qualified experienced engineers. The number, duration and category of supervisory personnel to be deputed for this activity shall be mutually decided by Contractor and Consultant/DPT. Consultant will supervise Contractor's work on round the clock basis.

#### **4.9 EXPERIENCE & QUALIFICATION OF THE PROJECT**

##### **MANAGER/ TEAM MEMBERS**

##### **4.9.1 PROJECT MANAGER:**

There shall be a professionally qualified (minimum B.E / B.Tech. or equivalent) Project Manager to lead the Project Team. The Project Manager must have experience of at least 10 years in the field of execution of Firefighting facility planning, design, detail engineering, Project execution and overall Project Management. He must be well versed with all aspects of study, including but not limited to data acquisitions, installation in Firefighting facility and system designing, knowledge of different field proven technologies, comparison and devaluation thereof to identify appropriate and latest proven technology, detailed design, preparation of tender document specific to the job requirement, material selection, operations, result analysis and troubleshooting, co-ordination and supervision of all kind of activities related to the construction of complete system and commissioning. He shall have the ability and authority required for performance of the job. He shall liaise with Consultant/DPA Project Managers for the proper co-ordination and timely completion of the job on any matters pertaining to the job. As far as possible, the Project Manager assigned for the Project at the start shall execute the Project till completion.

##### **The major responsibilities of the Project Manager and his team shall be:**

- A. Project Manager shall be engaged by Contractor on receipt of LOA.
- B. Project Manager will convene the Kick-off meeting.
- C. Liaison with Consultant/DPA.
- D. Carryout overall project management and administration of the project works covering planning, review, co-ordination and reporting.



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E. Project management and technical inputs to Consultant/DPA in deciding methodology of project execution and assist DPA in obtaining Government clearances.

F. Responsible for all acts and omissions of the Contractor in regard to successful execution and commissioning of the project.

G. Expediting works like placement / deployment of personnel at contract /sub vendor works.

H. Overall management of the project.

I. Co-ordination of activities relating to the project of various departments within Contractor's office. The PM (Project Manager) will not use the project data for any purpose other than this project and will ensure complete secrecy of the data.

J. Overall planning, scheduling, monitoring and controlling of overall project progress.

K. Hold periodical review meetings with Consultant/DPA to monitor the progress identify constraints, slippages and suggest remedial measures.

L. Preparation of reports as directed by EIC

M. Documentation & Submission of Reports

N. Necessary technical write-up and drawings shall also be submitted to DPA to enable them to prepare detailed Project Report.

O. Prepare Procurement Status Report on monthly basis.

P. Management of Engineering, Procurement and Construction Services.

#### **4.9.2 CONSTRUCTION MANAGER:**

There shall be a professionally qualified Construction Manager to lead the Construction Team at site. The Construction Manager must have experience of at least 8 years in the field of Firefighting facility processing facility planning, design, detail engineering, Project execution and overall site Project Management. He must be well versed with all aspects of study, including but not limited to data acquisitions, installation in Firefighting facility industry and system designing, knowledge of different field proven construction technologies, comparison and evaluation thereof to identify appropriate and latest proven technology, preparation of tender document specific to the job requirement, material selection, operations, result analysis and trouble shooting, co-ordination and supervision of all kind of activities related to the construction of complete system and commissioning. He shall have the ability and authority required for performance of the Contractor's job. He shall liaise with Consultant/DPA Project Managers for the proper co-ordination and timely completion of the job on any matters pertaining to the job. He shall liaise with their engineering office and government agencies pertaining to project. He shall ensure safe operation and execution of the work at site. Strictly ensure proper safety and quality work at site.

#### **4.9.3 CONSTRUCTION TEAM MEMBERS:**



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EPC Contractor will depute following qualified persons at site, as minimum to overview day to day construction work. EPC Contractor will submit CVs / Bio Data of all the persons being deputed at site for Consultant/DPA approval. Only approved staff will be deputed at site.

**Construction Engineers:** They should be degree holder in their respective field and should have at least 2 years of experience in construction of firefighting facility.

**Construction Supervisors:** They should be diploma holder in their respective field and should have at least 2 years of experience in construction of firefighting facility.

**Safety Officers:** They should have required certificate from reputed University and must have at least 2 years of experience in construction of firefighting facility,

**QA/QC Engineers:** They should be degree holder in their respective field and must have minimum 5 years of experience in large construction industry.

**Skilled labours:** They should be minimum ITI / trade certificate holder in their respective field and should have minimum 5 years of experience.

#### **4.10 CONSTRUCTION WORK AT SITE:**

The construction supervision services would include the following, but not limited to:-

4.10.1 The Contractor will appoint a Safety Officer who must be conversant of all safety and statutory regulation during the period of construction.

4.10.2 Provide necessary competent supervisory staff in the related discipline at the construction site to review / supervise construction, erection of pipe and equipment, civil and structural engineering works and others, approve the materials and workmanship of works.

4.10.3 Planning and monitoring of construction and erection works.

4.10.4 Site development works like site grading, construction of roads, culverts, storm water drains, etc.

4.10.5 Carry out civil / structural/ mechanical erection of equipment and machinery and piping.

4.10.6 Carry out erection and installation of all electrical and instruments as necessary.

4.10.7 Carry out final tests of plant after erection/installation of equipment and machinery, electrical, instruments and piping for turnkey package. DPA/Consultant shall witness the construction of the various equipment and machinery during various stages of construction and the various tests at the supplier's works. DPA/Consultant shall also witness the inspections/hydro-test etc. carried out during various phases of manufacturing of equipment, vessels etc. in the supplier's work.

4.10.8 Organize site management meeting with the Consultant to ensure that work is carried out in safe and workman like manner in accordance with the specifications and to the programme.

4.10.9 Organize monthly project review meeting with DPA/Consultant.





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4.10.10 DPA/ Consultant shall monitor the entire execution of the project and shall give necessary guide lines to its requirement.

#### **4.11 COMMISSIONING ACTIVITIES:**

This activity will also be performed phase wise which is described in execution methodology. After testing and mechanical completion of project, Contractor should ensure commissioning of Fire Protection system to the satisfaction of DPA/ Consultant and also arrange training of personnel from DPA in coordination and conjunction with Consultant during the period of trial run for day to day running and trouble shooting of the piping system. Activities shall include but not limited to:

4.11.1 Review of plot plan, unit layouts, instrument logics etc. as necessary.

4.11.2 Review start up, shutdown and emergency provisions and procedures.

4.11.3 Complete planning and scheduling of plant start-up activities, wherever necessary.

4.11.4 Contractor shall prepare pre-commissioning programme and to assign priorities during final stages of construction work.

4.11.5 Check all units in the piping system for mechanical completion and precommissioning at site.

4.11.6 Contractor shall ensure that all statutory approval for the installed instrument/facility has been obtained prior to commissioning of the complete piping system and submit all the documents and certificates to DPA/Consultant.

#### **4.12 SITE CONSTRUCTION MANAGEMENT:**

The Contractor will set up an office at Gandhidham near Deendayal port at its own cost for day today co-ordination. Any infrastructural facility required for the same will be arranged by the Contractor.

#### **4.13 DOCUMENTATION & SUBMISSION OF REPORTS:**

CONTRACTOR shall prepare and submit reports as follows and as mentioned in various clauses and annexure. The format of the report shall be discussed and mutually agreed between DPA/Consultant. **Reports shall be submitted to Consultant.** Reports should include the followings:

##### **Project Progress Reports shall include –**

**4.13.1 Daily Report:** Daily report should include day to day progress report of site work.

**4.13.2 Weekly report:** Weekly reports will include the works completed at the end of the week and also the target jobs of the next week. It should also include material or equipment procurement status report, if any.

**4.13.3 Monthly Report:** Monthly progress reports shall include the historical background of the Project; a brief description of actual versus planned progress; problems encountered and



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resolutions; and comments on the quality of work and Contractor's performance. The reports shall include graphs or charts showing physical progress of works. The reports shall also include colour photographs showing completed work and construction activities undertaken during the relevant reporting period. Monthly report should also indicate item wise detail status of various procurements and status of statutory approvals. Monthly report will contain a section devoted entirely to an assessment of the impact of accumulated delays, if any, in the execution of works and a projected date for completing the delayed jobs without affecting the Project schedule. The progress report shall highlight the specific delays, impact of accumulated delays, reason for such delays, action plans proposed to bring back to original schedule, major bottlenecks and holdups. The format of the progress report shall be discussed and mutually agreed by DPA/Consultant. Each report shall contain a section devoted to reporting the status of Emergency Works and Work Orders issued by the Contractor, detailing the dates of notification and subsequent actions and the time and cost effects as assessed, where appropriate.

**4.13.4 Quarterly Report:** The CONTRACTOR shall prepare quarterly reports that summaries the content of the monthly reports, giving an overview of progress on the contract and the main issues that have arisen during the period. Each quarterly report shall contain an introduction presenting historical project background to set the current report in context. The report should contain an analysis of the Contractor's performance. Ten copies of these reports shall be submitted to Consultant within fourteen days after the end of each reporting period.

**4.13.5 Accident Reports:** A report of the circumstances of any significant accidents occurring during execution of the project shall be forwarded to DPA/Consultant.

#### **4.14 OTHER DOCUMENTATION:**

CONTRACTOR shall keep record as mentioned below, but not limited to the followings:

4.14.1 Maintain a set of drawings ("as-built" drawings) recording all details of the work as actually executed.

4.14.2 Maintain at the project site orderly files for correspondence, reports of site meetings, product and material submissions, site instructions, information and drawings issued subsequent to the start of works contract, as well as Consultant clarifications and interpretations of the contract documents, progress reports and other related documents.

4.14.3 Keep a diary or log book, recording daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures.

4.14.4 Records of the Meetings.

#### **4.15 Deleted**

#### **4.16 Deleted**

#### **4.17 GUARANTEES:**

**4.17.1 GENERAL:** Contractor shall guarantee that the design and engineering works and services shall be as specified and technical documentation to be developed shall be in



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accordance with sound and established engineering practices, using International Standards and Indian Codes and Regulations, wherever applicable, for the purpose specified, free from defects and suitable for respective uses intended.

**4.17.2 ENGINEERING:** In the event of faulty engineering, procurement, construction i.e. error or omission the technical studies, work performed by EPC Contractor; in respect of work described herein, for which Contractor will be solely responsible, Contractor must agree to provide services to furnish corrective technical studies & engineering, and replace plant /machineries / equipment as may be required without any additional cost to DPA.

**4.17.3 MECHANICAL:** EPC Contractor will obtain required guarantees/ warranties from EQUIPMENT and MATERIAL VENDORS and erection Contractors against defects in materials and workmanship.

#### **4.18 DRAWINGS / DOCUMENTS:**

I. The EPC Contractor shall prepare all engineering documentation & drawings and submit three (3) sets each to DPA/ Consultant of the scrutiny and approval before execution. The EPC Contractor further shall submit to DPA Six (6) sets of finally approved documents and drawings.

II. In particular, but not limited to, Contractor will provide the documents & drawings which shall include (including those mentioned in the entire tender)-

- Piping Layout
- Updated Process Flow Diagram(s)
- Mechanical Flow sheet(s)
- G.A & cross sectional Drawings along with data sheets
- Civil foundation, Building detail drawings
- Structural & Fabrication Drawings
- Construction & Working drawings
- Electrical single-line Diagram
- Annual Operating and Maintenance Manual
- As-built Drawings

#### **5.0 GENERAL REQUIREMENTS**

Sea water shall be used as the primary source for water supply for firefighting. All the relevant system sub-systems must be selected based on compatibility with service conditions mentioned in guidelines enclosed. The water based firefighting systems for the protection of the oil jetty shall comprise the following components:

- a) Hydrant / Spray system



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b) Jumbo curtain system

c) Tower and Ground Monitor System

d) Foam system

The Fire water lines & Foam Lines must have adequate isolation valves for flexibility as well as exclusivity and connectivity.

Foam system to be connected to foam tank and these foam tanks must be interconnected to the jetty without any delay or loss of foam.

All the firefighting water requirement of Jetty is to be obtained from Vertical turbine pump sets (FM/UL listed), as there is no dedicated fire water storage tanks above ground.

Fire pipeline must be made of internally cement coated pipes as the sea water corrodes the pipes.

The fire pipeline sections should be joined by welding for the entire length with adequate number of vertical expansion joints. Since the vertical expansion joints take less space than horizontal expansion joints. These lines shall be fitted with isolation valves for carrying out efficient and swift repairs if needed.

Minimum design flow rates and pressures to be achieved at various locations as per design philosophy and criteria. The fire water system should be designed for a minimum residual pressure of 7 kg / cm<sup>2</sup> at the hydraulically remote point of application in the terminal.

Jumbo curtain nozzles, on the central loading platform in front of the loading/ unloading arms along with associated piping, restriction orifices, motorized valve, strainer, cables, etc., and capable of operating from the control panel for Oil Jetty and operational from Control room.

63 mm size double headed fire hydrants with 2 separate landing valves. Fire hydrants to be installed in the fire water network at 30m or as per the standard in high hazard area and 45m interval in other areas as per OISD 156.

Suitable nos. of Hose cabinets each with 2 Nos. of suitable length 15 meters reinforced rubber-lined hosepipe with end couplings and nozzles for each oil jetty to be provided for whole the project area.

Foam storage tanks shall be Stainless Steel (SS 316L) with Level indicators on each Foam tank along with SS 316L piping & Valves, safety valves, non-return valves etc shall be provided.

Foam proportioning system with piping valves, gauges, pressure switch with control panel cable work shall be furnished.

Supply, loading/unloading & filling of Foam in each tank.

The control room at jetty area shall house the followings: -

Remote controlled operation panel for motor & Diesel Engines to be installed at control room.

Operation of Motor operated valves panel.



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Operation of Foam pumps (Start/Stop)

Control Panel for the Gas Detection System & Flame Detection system for the Jetty.

Control room to be provided with emergency switch for the Pumps, Diesel Engines, and Motors.

Remote control for tower monitors to be provided.

Remote control for motorized vertical turbine pumps, Motors, Diesel Engine and Jockey pumps, Motorized valves to be provided.

Operation of Diesel & Electric driven main fire pump from control Desk with an annunciator

Jockey pump running status & Mimic Diagram shall be provided.

Necessary cabling is also in the scope of the contractor.

Pressure sensors switches & safety cut out.

PA system, Flame / GAS Detection System at each Oil Jetty as per the design standard

Contractor shall be responsible for compliance of the system designed to the requirements of statutory bodies like OISD (Oil Industry Safety Directorate) / NFPA (National Fire Protection Association).

Any Individual item/equipment and material including contractual obligations which are not specifically mentioned in the specification but are required to make the equipment and installation complete and also for trouble free maintenance, for safety provision, smooth and safe operation for equipment as well as smooth execution of contract to the complete satisfaction of the Owner shall be tenderer's responsibility, scope of supply and work.

The Tenders shall include in his scope of supply all chequered plates, (Aluminum alloy, minimum 5 mm thick in pump room floors) components, materials, accessories and sundry item required to render the installation/erection fully operative in all respect even though every individual items may not have been detailed out explicitly in the specification.

Clearing of all old materials from the premises and depositing the same at designated location as directed by Engineer in Charge.

Obtaining statutory clearness from Electrical Inspector/Factory Inspector/CCE, Nagpur, Dock Safety and any other statutory Government bodies as applicable of tenderer's work, installation, drawings etc.

### **5.1 TRAINING SCHEME:**

The Tenderer shall prepare and submit a scheme of training covering all the system Fire Protection system, foam system, gas detection system etc operation, maintenance, troubleshooting etc. The programme shall be prepared by the tenderer shall be reflective and appreciative of the long term interest in the sustained operation of the systems, equipment provided.

### **5.2 Deleted**



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### 5.3 Technical Specifications and Data Sheet for Pumps

All the technical specifications and data sheet shall be filled and to be forwarded by the bidder by duly signed and stamped along with the Authentication of OEM of technical specification and data sheet during bidding, otherwise the bid shall be considered as non-responsive and the same will be rejected.

#### Indicative Technical Specifications and Data Sheet of Main Motor Driven Pump Set

Details	Employer required Make and specifications	Make and Specifications offered by the Bidder
Pump details and make	Pump Make: Amstron/ Grundfos/ KBL/ Flowmore/ Pentair/ Flowserve/ WILO- Mather&Platt/ Lubi  Motor Make: CGL/ ABB/ BBL/ Siemens/ Marathon HT Motor	
Application	Sea Water Handling Vertical Turbine Fire Pump Set	
Type of Pump (Mandatory)	FM/UL Approved Main Pump (Mandatory)	
Pump Components	<b>Non-FM/UL</b> HT Motor Driven and comprising of the following components; a. HT motor b. Coupling c. Starter panel d. Required cables  The above mentioned components are only indicative but not limited. However, the Contractor has to ensure to install all the facilities for the new pumps.	
No. of Pumps	02	
Rated Capacity (m <sup>3</sup> /hr)	820	





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Total Head (Mtrs)	160	
No. of stages	4	
Liquid	Sea Water	
Temperature	Ambient	
Sp. Gravity	1.03	
Speed (RPM)	1450	
Pump Efficiency (%)	81%	
Pump input (kW)	481	
Recommended Motor Rating (kw)	550 kw	
Type of discharge head above/below floor	Above Floor	
Thrust Bearing type: Anti-friction / Tilting	Anti-friction	
Method of Lubrication: Self / Oil / Forced	Self-Water	
<b>COLUMN ASSEMBLY</b>		
Column pipe size (mm)	300	
Delivery pipe size (mm)	300	
Column pipe thickness	8 mm	
Bowl / Suction Bell (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Impeller (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Imp. Shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Line shaft/Head shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Column pipe (Mandatory)	SUP DUP SS ASTMA 240M UNSS32760	



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Shaft sealing	Gland packing	
<b>HT Motor Details</b>		
<b>Motor Make</b>	<b>CGL/ABB/BBL/Simenns/Marathon or Equivalent</b>	
Rating (kw)	550 kw	
Mounting	Vertical solid shaft flange type	
Speed (rpm)	1450	
Enclosure	TEFC-IP55	
Frequency	50 Hz (+/-5%)	
Voltage / Battery Voltage	3.3 / 6.6 Kv	

### Technical Specifications and Data Sheet of Main Engine Driven Pump Set

Details	Employer required Make and specifications	Make and Specifications offered by the Bidder
Pump details and make	<b>Pump:</b> Amstron/ Grundfos/ KBL/ Flowmore/ Pentair/ Flowserve/ WILO-Mather&Platt/ Lubi  <b>Diesel Engine:</b> Caterpillar, Cummins, MVM, RUSTON/ KOEL	
Application	Sea Water Handling Vertical Turbine Fire Pump Set	
Type of Pump (Mandatory)	FM/UL Approved Main Pump (Mandatory)	
Pump Components	Non-FM / UL Diesel Engine Driven and comprising of the following	



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	<p>components;</p> <ul style="list-style-type: none"> <li>a. Pump Motor</li> <li>b. Diesel Engine</li> <li>c. Gear Box</li> <li>d. Coupling</li> <li>e. Starter panel</li> <li>f. Required cables</li> </ul> <p>The above mentioned components are only indicative but not limited. However, the Contractor has to ensure to install all the facilities for the new pumps.</p>	
No. of Pumps	05	
Rated Capacity (m <sup>3</sup> /hr)	820	
Total Head (Mtrs)	160	
No. of stages	4	
Liquid	Sea Water	
Temperature	Ambient	
Sp. Gravity	1.03	
Speed (RPM)	1500	
Pump Efficiency (%)	81%	
Pump input (kW)	480	
Recommended Engine Rating (HP)	750 HP	
Type of discharge head above/below floor	Above Floor	
Thrust Bearing type: Anti-friction / Tilting	Anti-friction	



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Method of Lubrication: Self / Oil / Forced	Self-Water	
<b>COLUMN ASSEMBLY</b>		
Column pipe size (mm)	300	
Delivery pipe size (mm)	300	
Column pipe thickness	8 mm	
<b>MATERIAL OF CONSTRUCTION</b>		
Bowl / Suction Bell (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Impeller (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Imp. Shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Line shaft/Head shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Column pipe (Mandatory)	SUP DUP SS ASTMA 240M UNSS32760	
Shaft sealing	Gland packing	
<b>MOTOR / ENGINE DETAILS</b>		
<b>Engine Make</b>	<b>Caterpillar/ Cummins/ MWM/ RUSTON/ KOEL Non-FM/UL</b>	
Rating (HP)	750 HP	
Mounting	Horizontal	
Speed (RPM)	1500	
Enclosure	Water heat exchanger cooled	
Frequency	-	
Voltage / Battery Voltage	24 V	

### Technical Specifications and Data Sheet of Jockey Pump Sets (Motor Driven)



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Details	Employer required Make and specifications	Make and Specifications offered by the Bidder
Pump details and Makes	<p><b>Pump Make:</b> Amstron/ Grundfos/ KBL/ Flowmore/ Pentair/ Flowserve/ WILO- Mather&amp;Platt/ Lubi</p> <p><b>Motor Make-</b> CGL/ABB/BBL/Siemens/Marathon LT Motor</p>	
Application	Sea Water Handling Vertical Turbine Fire Pump Set	
Type of Pump	<p>Jockey Pump with TEFC motor Driven and comprising of the following components;</p> <ul style="list-style-type: none"> <li>a. Pump</li> <li>b. Motor</li> <li>c. Coupling</li> <li>d. Starter panel</li> <li>e. Required cables</li> </ul> <p>The above mentioned components are only indicative but not limited. However, the Contractor has to ensure to install all the facilities for the new pumps.</p>	
No. of Pumps	2	
Rated Capacity (m <sup>3</sup> /hr)	210	
Total Head (Mtrs)	160	
No. of stages	2	
Liquid	Sea Water	



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Temperature	Ambient	
Sp. Gravity	1.03	
Speed (RPM)	2900	
Pump Efficiency (%)	72%	
Recommended Motor Rating (kw)	90 kW	
Type of discharge head above/below floor	Above Floor	
Thrust Bearing type: Anti-friction / Tilting	Anti-friction	
Method of Lubrication: Self / Oil / Forced	Self-Water	
<b>COLUMN ASSEMBLY</b>		
Column pipe size (mm)	200	
Delivery pipe size (mm)	200	
Column pipe thickness	5 mm	
<b>MATERIAL OF CONSTRUCTION</b>		
Bowl / Suction Bell (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Impeller (Mandatory)	Sup DUP ASTMA 890/890M-CE3MN-5A	
Imp. Shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Line shaft/Head shaft (Mandatory)	ST ST ASTMA 276-410 ANLD	
Column pipe (Mandatory)	SUP DUP SS ASTMA 240M UNSS32760	
Shaft sealing	Gland packing	
<b>LT Motor Details</b>		
Motor Make	CGL/ABB/BBL/Siemnns/Marathon or Equivalent	





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Rating (kw)	90 kw	
Mounting	Vertical solid shaft flange type	
Speed (RPM)	2900	
Enclosure	IP55 or more	
Frequency	50 Hz (+/-5%)	
Voltage / Battery Voltage	415 V (+/- 10%)	

### 5.3.1 VERTICAL FIREWATER PUMP

Design, Engineering, inspection, Supply, Erection, Testing & Commissioning of Diesel engine driven/Motor Driven Vertical Turbine pumping set (FM/UL Approved Main Pump & Non-FM/UL components) and pump accessories complete and connected by a flexible coupling to a water cooled diesel engine mounted on a common structural base plate with anti-vibration pads and foundation complete with AMF panel, battery (including one spare battery) battery charging, cooling system, fuel tank, fuel system, automatic starting arrangement, exhaust pipe with mineral wool / rock wool insulation of specified thickness as per EIC of required length to discharge at suitable height with muffler to meet latest environmental norms, day oil tank (storage of 8 hrs. running capacity) mounted on suitable structural supports, common base plate, flexible coupling, coupling guard, power and control cable including termination at pump, panels etc, erection of matching flanges. Supply & erection of CS bolts, nuts & gaskets. consumables, Configuration, Interfacing, erection at site, Testing & Commissioning as per Job specifications and Special Instructions enclosed. Assembly of parts/ sub-assemblies erection of interconnection piping, placing / erecting the equipments supplied by company above ground at all elevation, fixing of foundation bolts welding wherever required, leveling, aligning, grouting with non-shrink grout material including chipping and dressing of foundation, carrying out trial runs and providing man power for testing, trial and start -up runs rectifying defects if any and completing the work in all respect as per drawing and specification, manufacturer's installation manual, general specification for erection of Rotating Equipment enclosed and instruction of Engineer-in-charge. Supply, Erection, Testing & Commissioning of Fire Pump Co-ordination Panel which will receive signal from two fire main / standby pumps and jockey pumps for start / stop through pressure transmitter and onward transmission of digital output signal to main control room, associated instruments including termination of cables.

Vertical turbine pump with suction from open sea and capable of adopting different Sea water level is to be supplied with diesel engine driven and electric motor driven installation. Also all the Pumps and Foot valves inside shall be coated with protection coatings like Ceramic coating to avoid marine growth.

Selected pump shall be capable of meeting respective firewater requirements for tower mounted water/foam monitor as well as jumbo curtain and water hydrant system for each oil Jetty.



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Stopping of the major pump sets shall only be done manually by operation of the respective stop push buttons mounted near the motor. The vertical turbine pump & Foam pumps shall be capable of remote operation and shall be subjected to performance test.

NPSH (Net Positive Suction Head): Designed for maximum efficiency (The fire pump will draw water from the OPEN SEA under suction lifts condition)

Inside of pump shall be coated with suitable protection coatings like ceramic coating to avoid marine growth. Both Pump and engine motor to be mounted and aligned on foundation of robust construction. Necessary foundation bolts along with the heavy duty vibration damper to be provided.

All rotating parts to be have suitable sheet metal guard.

Suitable Positive priming device to be incorporated and pressure gauge connection with a stop cock to be provided at the pump discharge. Pressure gauges to be supplied.

Each pump shall be provided with a Name plate indicating Delivery Head, Capacity, RPM, etc.,

## ENGINE SPECIFICATION

The engine should be turbo-charged, vertical inline, water cooled (preferably heat exchanger type), four stroke, cold start, heavy duty compression ignition engine provided with spark-arrestor. The engine shall be provided with self-starting arrangement comprising of battery, cable & self starter and manual cold starting kit. The engine shall have protection against low lube oil pressure, high lube oil temp and high water temp. The Engine shall be capable of remote operations also. Lube oil gauge, water temperature gauge and lube oil pressure gauge to be provided and mounted on a separate panel away from the engine with necessary piping etc. and fitted to the same base plate with anti-vibration mounting. Silencer/muffler and other standard accessories are to be provided as necessary. Engine performance to be tested and certified as per IS10002.

M.S. fuel tanks of all welded construction to be provided. The capacity of the tanks of 6mm thick shall be sufficient to allow the engine to run on full load for six hours continuously. The tank is to be provided with suitable level gauge so that oil level in the tank can be viewed from outside.

Necessary hoses, for transfer of fuel from tank to fuel pump and return line from injector leak off to fuel tank to be provided.

One No. foot valve having size 2 inch bigger than the suction port dia. with strainers for each pump.

Additional engine starting panel preferably wall mounted, comprising of start bottom, stop bottom, ammeter, battery charging indication with necessary piping & cables to be provided at the pump room.

As the system will be in auto mode with the help of Jockey pump, the engine panel shall be incorporated with suitable provision on panel of Auto/manual operation.

Once the main pump starts running the jockey pump to be in cut off mode.

## 5.3.2 FIRE WATER PIPING



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Complete work of supply of pipes, including all taxes, duties, transportation and inspection charges but not limited to, the following items in accordance with relevant specifications indicated in scope of work, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. The pipes shall be cement lined as per standard specification.

FABRICATION, ERECTION, INSTALLATION, PAINTING AND TESTING OF pipes including Receiving and taking over of all materials, transportation including loading, unloading, handling including arranging all necessary storage area(s) thereof, as required; supply of all balance materials, equipment, consumables as defined in Contractor's scope of supply and their transportation to the work site(s); performing all above ground/underground piping fabrication works including cutting, edge preparation (inclusive of grinding the edges of pipes, fittings etc. to match with the matching edges of uneven/ different thickness wherever required), fit up, bending, pre-heating wherever required, welding, threading etc.; fabrication of fittings like miter bends, tees, reducers etc and erection of the same, erection of pipes of all types and thickness over sleepers, overhead on racks and at all elevations; hook-up with, existing header, equipments etc, erection of fittings of all sizes and types i.e. elbows, reducers, tees, half coupling etc cleaning and flushing, carrying out hydrostatic test, carrying out 10% non-destructive testing of each size such as radiography by gamma ray, magnetic particle, liquid penetration etc., carrying out repairs if any and re-radiography, pre-commissioning and commissioning; clean-up and restoration of site, preparation of as built drawings, documents and project records; transportation of surplus free issue materials to designated place(s); completing all works in all respects as per the drawings, specifications, standards and other provisions of Contract and instruction of Engineer-in-Charge.

Painting of pipeline with fittings as per DPA's specification, Supply of paints, solvents and primers, preparation of surfaces by sand/grit blasting using one of the abrasives and application of Zinc Ethyl Silicate Primer (P1- One coat @ 75 microns DFT / coat), Two pack epoxy – polyamid mio Intermediate / undercoat paint (U1- One coat @ 100 microns DFT/coat minimum) and Two pack aliphatic acrylic polyurethane finish paint ( F2-Two Coats @ 40 microns DFT /coat minimum) suitable for normal corrosive painting environment as defined in contract document. Identification, lettering/ numbering, colour coding and colour bands as per Industry Quality Control manual etc. as specified including rub down and touch up of shop primer or scrapping of shop primer wherever required and providing of scaffolding for all heights, labour, materials, tools and tackles, consumables, supervision etc. to complete the work in all respect as per Specification, Drawings, Standards and instruction of Engineer-in-Charge. Painting shall be done by spray only. Job also includes trenching to all types of soil to specified depth, laying the already wrapped and coated pipes, back filling the trenches with available approved soil and also laying the pipes through hume pipes/culverts. Wrapping of underground pipeline as per IS: 10221 to be included. In case for UG piping after completion of the work the ground surface shall be suitably compacted and covered concrete as directed by EIC.

All the new pipes for carrying seawater to be used in the system shall be having suitable wall thickness. The Contractors shall provide the required pipe support, specials reducers, expanders, puddle pipe, fittings, flanges, gaskets, nuts and bolts etc



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The tenderer shall provide necessary steel clamps, saddles and support for duct foot bends etc. Suitable support pads to be provided to the pipelines wherever it rests on the pedestals. The vertical pipeline to water / foam monitor shall also be properly supported / fixed by providing suitable steel brackets/clamps and stays etc.

All pipelines to be laid on service platform, pump houses are to be supported by providing steel / R.C.C. saddles with clamps fittings and fixtures. All pipes carrying foam compound to be used in the system shall be of stainless steel 316L grades of suitable schedule and should be hydrostatically tested to 1.5 times of design pressure.

iv. All pipes should be supplied in complete conformity to all requirements specified in the standards.

v. Suitable pressure gauges to be provided in the fire water network / foam injection lines at strategic locations.

vi. Fire Water Requirement/Foam Requirement and Pipeline sizing calculation to be furnished.

### **5.3.3 Valves:**

Complete work of Design, supply & Erection of valves (CS or higher in case of ERW & SS valve in case of SS pipe) including supply of matching companion flanges. including transportation and inspection in accordance with relevant specifications indicated in scope of work, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and installation of all types of valves at all locations (UG/AG) by bolting, threading or welding including erection of matching companion flanges, supply & erection of gaskets, supply & erection of nuts & bolts, alignment, fit-up, welding etc. at all elevations of pipe sleepers, supports or overhead on racks, equipments nozzle & painting etc. supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per specifications and instructions of Engineer-in-charge including servicing/cleaning of valves wherever required.

### **5.3.4 Y/T Type Strainers:**

Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation to store of "Y / T" type strainer with CS body & SS strainer ( for Fire Water lines) & SS Body & SS Strainer (for Foam Lines) including supply of matching companion flange as per Data Sheet/ etc in accordance with relevant specifications, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. Erection, testing & commissioning of "Y / T" type strainer including erection of companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, alignment, fit-up, welding etc

### **5.3.5 Hydrants:**

A well-designed Hydrant system is the backbone of entire firefighting system as it fights fire of all classes of risks. The entire jetty area is covered with a water based fire hydrant network. For the purpose of hydrant system design, the Jetty have been considered as high Hazard



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occupancy as per TAC classification. Distribution mains form ring around each unit, which is connected to the ring main running in the vicinity, which mainly consist of double outlet landing valves, monitors, fixed water spray system etc. The work shall be carried out as per OISD: 117. The fire water network lines shall be continuously kept pressurized at 7.0 kg/cm<sup>2</sup> (g) (at the hydraulically remotest point of application). Activation of hydrants / monitors / water spray system will send a signal in the control room.

Distribution mains form ring around each new proposed area, which is connected to the ring main running in the vicinity. The network will be laid generally above ground. Wherever it is laid underground, it should be laid at an average depth of 1m below ground level and 1.2M (Min.) below the ground level at road crossings. All such underground pipes shall be provided with suitable corrosion protection as per IS: 10221. Each area is being covered with adequate numbers of fire hydrants and water monitors. The fire protection system will also have hose reels, hose boxes, isolation valves, flanges, fittings along with complete electrical and instrumentation work etc. All double headed hydrants, monitors and hose reels shall be provided with a cut-off gate valve on tapping (stand post) from main fire water header with ISI / TAC approval. Hydrants and monitor connections shall be through 4" / 6" line. Double outlet hydrant valves shall be laid above ground at a height of 1.2M. At least 10% of all welded joints shall be radio graphically tested and half of radio graphed joints shall be field joints.

Hose boxes with all accessories shall be provided at locations in line with TAC guidelines and construction of hose box shall be made as per specifications given in OISD-115. Each hose box shall consist of two hoses of 63mm dia. 15m long or as per the design RRL each with end couplings, 2 nos. jet nozzles with branch pipe or two universal branch pipe as per IS: 903. Hoses shall confirm to IS: 636 Type-B.

Hose reels shall be considered as first aid fire contingency at strategic locations / units like control room and administrative building, non-plant rooms etc. Hose reels shall be located 40m or as per the design apart and shall cover all parts of the buildings in ground floor and upper floors. Hose reels shall be floor-mounted type and they shall have water connection from hydrant network.

Above ground fire water pipes shall be painted fire red confirming to shade no. 536 of IS: 5.

All fire water piping shall be hydro tested. Adequate nos. of isolation valves in the fire water network shall be provided to ensure easy maintenance at the affected part of the network and at the same time uninterrupted water supply to the rest of the network for firefighting remains available.

The hydrants (landing valve) outlets shall be situated 1m above ground level.

The hydrants/monitors shall be erected in such a location that they will be easily accessible. Storage of any kind on or around the hydrant is prohibited.

Hydrants / monitors located in places where they are likely to be damaged by vehicular traffic shall be suitably protected on all sides against possible damage.

Advantage shall be taken of convenient door and / or window openings to place hydrants so that only a minimum length of hose is required to reach the openings through which fire may be





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attacked. In case of continuous blank walls, suitable provision shall be made on the walls near hydrant posts for easy access inside the premises.

Hydrants heads shall be located not less than 7.5m or as per the design from the face of the buildings / structures or edge of the storage plot.

All hydrants shall consist of stand post with two nos. single outlet landing valves conforming to IS: 5290 – 1993 (Type -A). The valve should be complete with hand wheel, quick coupling connection and blank cap. The hydrant shall be laid on main tee off to a height of 1.0m from ground level along with isolation valve.

The scope of work includes ,but is not limited to, Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation to store of 2 way stand post type hydrant with two nos. single outlet 100 mm inlet bronze landing valve (conforming to IS : 5290 : 1993 - type -A) with matching flanges (Conforming to IS : 6392 Table-17 / ANSI B 16.5), with control fitted with 63 mm dia instantaneous female coupling on the outlet complete with orifice flange as required, blank cap and chain.bolts, nuts and gaskets, etc., complete as per data sheet & technical specification. The assembly shall be suitable for direct erection over companion flange on branch outlet from main header. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and installation by bolting, threading or welding, including erection of matching companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required.

### **5.3.6 Water Monitors:**

Water monitors shall conform to IS: 8442 – 2008 (Type I) including suitable orifice plate at monitor. The monitor shall be so designed that it shall allow free flow of water with minimum friction loss and maximum stability against nozzle reaction. Monitors shall be constructed in such a way that the flow of water can be directed at any angle on horizontal and vertical axis including locking arrangements.

The scope of work includes ,but is not limited to, Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation of stand post type water monitor (as per IS : 8442 : 2008, UL Listed / FM Approved) as per Data sheet & Technical Specification with jet / spray nozzle with drain provision and all other accessories including suitable orifice plate and matching flanges of 4" size confirming to IS: 6392 Table - 17, bolts, nuts and gaskets complete including painting as specified & directed by EIC. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and installation by bolting, threading or welding,including erection of matching companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required.

### **5.3.7 Water Cum Foam Monitors:**





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It shall be UL listed stand post type fixed type water cum foam monitor. The water cum foam monitor shall have common barrel fitted with self-educing, non-aspirating type water cum foam nozzle with fog and jet facilities.

The scope of work includes ,but is not limited to, Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation to store of stand post type water cum foam monitor (as per IS : 8442 : 2008, UL Listed / FM Approved) with foam pickup tube as per Data sheet & Technical Specification with jet / spray nozzle with drain provision and all other accessories including suitable orifice plate and matching flanges confirming to IS: 6392 Table - 17, bolts, nuts and gaskets complete including painting as specified & directed by EIC. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and installation by bolting, threading or welding, including erection of matching companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required.

### 5.3.8 Hose Cabinet

Hose cabinet shall be suitable to accommodate two delivery hoses of 63 mm dia, each of 15 m (or as per the design) length with end couplings. The cabinet shall be of self-supporting type suitable for outdoor installation. Necessary hangers and brackets for hose, nozzles and branch pipe shall be provided with in the cabinet. The cabinet shall be provided with double panel glass door, handle type lock, a small recess to keep cabinet key under glass cover, a small hammer secured to the cabinet with a chain to break key glass cover.

Cabinet shall be made of 3m thick FRP material with double doorframe glass covered. Glass shall be securely fitted to the doorframe in a standard manner.

The hose cabinet shall be painted with 3 coats each of fire red enamel paint from outside and white from inside. The quality of paint shall be as described under the chapter "Painting".

The scope of work includes, but is not limited to, Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation to store of FRP fire hose cabinet suitable for accommodating 2 nos of 15 mtrs long canvas hose with coupling, branch pipe and nozzle for external hydrants with double glass door, lock & key including outdoor mounting arrangement complete as specified. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and Erection of FRP fire hose cabinet including supply of all consumables, manpower, equipment, supply & erection of nuts & bolts, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required.

### 5.3.9 Hoses:

63mm x 15 m long cotton synthetic fibre, seamless circular woven jacketed fire hoses conforming to IS: 636 type A complete with nozzles and accessories shall be supplied.



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The scope of work includes ,but is not limited to, Design, Engineering, Manufacturing, Testing, Inspection, supply, erection, testing, commissioning including Packaging, Forwarding, Transportation to store of 63 mm dia 15 m long RRL Hose including gunmetal male and female instantaneous type coupling , machine wound with GI wire complete in all respects. Hose to IS: 636 type A, UL Listed / FM Approved and coupling to IS: 903: 1984 with ISI certification.

### **5.3.10 Supports, Guides and Anchors**

Correct installation of supports, restraint guide at pumps and other equipment maintaining clearances as per support drawing shall be ensured.

Pipe supports are designed and located to effectively sustain the weight and thermal effects of the piping system and to prevent its vibrations. Location and design of pipe supports will be shown in drawings for lines 3" NB and above. For line below 3" NB Tenderer shall locate and design pipe supports in line with standard practice and obtain approval of Engineer – in – charge. However any extra support desired by Engineer-in-charge shall also be installed.

No pipe shoe / cradle shall be offset unless specifically shown in the drawings. Hanger rod shall be installed inclined in a direction opposite to the direction in which the pipe moves during expansion.

Preset pins of all spring supports shall be removed only after hydrostatic testing and insulation is over. Spring shall be checked for the range of movement and adjusted if necessary to obtain the correct positioning in cold condition. These shall be subsequently adjusted to hot setting in operating condition. The following points shall be checked after installation, with the Engineer – in –charge and necessary confirmation in writing obtained certifying that:

All restraints have been installed correctly.

Clearance has been maintained as per support drawings.

Insulation does not restrict thermal expansion.

All temporary tack welds provided during erection have been fully removed.

All welded supports have been fully welded.

Fabrication and erection of supporting elements and structural fixtures wherever required and pointed out by Employer/ DPA whether indicated in drawing or not, to prevent vibration, excess sag etc. shall be carried out by the Tenderer.

### **5.3.11 Bolts, Nuts and Gaskets**

Proper number and size of bolts and nuts as per drawings and specifications shall be provided. Approved quality of grease mixed with graphite powder shall be applied thoroughly on all the bolts and nuts during storage.

### **5.3.12 Assembly**



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The assembly of various piping components shall be done so that the completely erected piping conforms to the requirements of the specification as well as the arrangement and details shown in construction drawings.

All flanged joints shall be so fitted that the gasket contact faces bear uniformly on the gasket and then made up with relatively uniform bolt stress.

Tightening of bolts in flanged joints shall be done in such a sequence that the gaskets shall be properly compressed in accordance with the design principles applicable to the type of gaskets used. All bolts shall extend completely through their nuts, but not more than 15 mm.

Steel to CI flange joints shall be made with extreme care, tightening the bolts uniformly after bringing flanges flush with gaskets with accurate parallel and lateral alignment.

#### **5.3.13 Pressure measurement:**

All pressure gauges shall be weather proof and shall be provided with 3-way cock.

Dial size for pressure gauges shall be minimum 100mm with black pointers and white dial.

Pressure gauges and indicators shall be safe up to 1.25 times the maximum operating/scale range.

Blowout disk shall be provided at the back.

Process connection shall be ½" NPT.

Safety glass shall be provided.

The case material shall be die cast aluminum.

#### **5.3.14 Remote Control Tower Mounted Monitors:**

The monitor shall be suitable for both foam and sea water. Each tower monitor shall be capable of discharging required foam/ water at required inlet pressure over a range of 95 mtrs respectively in horizontal direction and 45 Mtrs in vertical Direction. It is the responsibility of the Tenderer to select a suitable monitor to ensure throw of 95 m from tower using the main pump specified. All the monitors shall be capable of discharging foam solution of AFFF concentrate low expansion foam.

The materials used for different parts of the monitor shall be as under:

- i. Barrel, Body – SS316L
- ii. Worm and Worm Wheel used for vertical and horizontal rotation of monitor- Zinc free bronze.
- iii. Horizontal and Vertical Swivel incorporating ball bearings- SS316L.
- iv. Column- Water/Foam solution Branch pipe-SS 316L.
- v. Bolts, Nuts & Washers- SS316L.
- vi. Electric Motors- IP 56, Flame /Explosion proof and 415 Volt.



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vii. Electro Hydraulic power pack unit, end couplings of braided hoses etc.,

The Monitor shall be capable of 340° rotation in either direction in horizontal plane and 60° (elevation) and 70° (depression) in vertical plane. Suitable electro-Hydraulic /equipment shall be mounted on the monitor so that rotation of the monitor can be achieved by remote control. The monitors shall also be fitted with deflectors remotely controlled from the control building. These shall be remote operated from control room of pump house at OJ 8 in addition to remote operation from field control panel located in safe area. The monitor assembly shall be designed to resist the nozzle reaction force experienced during the operation of the monitor. The entire assembly shall be tested to a internal hydraulic pressure of 20 Kg/ cm<sup>2</sup>. A suitable pressure gauge shall be provided to the inlet connection of the monitors at the top of tower and on platform. Performance data is in still air condition.

#### **5.3.15 Remote Control Station for Tower Monitor:**

Remote Electric Control Station shall have following control features. Panel to be mounted in a safe area

Common joy stick per monitor for up/down left/right movement.

i. One push button per monitor for nozzle spray/straight stream pattern/foam/fog.

iii. Power On indicator.

vi. Foam pump on/off switch with running light indication.

vii. On/off switch for MOVs on Water & Foam Line.

xi. Monitor manual override provided from monitor itself. xiv. Main control panel is to be installed in Control room in safe area.

xv. Remote control with joystick is required to be provided for rotation of foam/water monitors in horizontal and vertical planes.

xvi. The electric remote control panel in the control room shall have the necessary controls for operations. The controls provided on the remote Control desk as per the design standard.

#### **5.3.16 Jumbo Curtain Nozzles:**

To protect the jetty installations and loading arms from the radiant heat due to fire on the tankers and to facilitate fire-fighting personnel to operate during fire each Jumbo curtain nozzles shall be able to produce dense water curtain of one meter wider on all sides than the surface area at required discharge rate of sea water at required inlet pressure. The nozzle shall be SS 316L with flange connection.

The Jumbo curtain header mounted with nozzles shall be laid above ground with supporting and provision of flanged joints in order to facilitate maintenance of jumbo curtain header nozzles as and when required.



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- i) The jetty shall be protected by water curtain system to separate the fire area and non fire area in case of fire at the jetty area or in the vessel. The number of jumbo Nozzles shall be selected so that adequate coverage is obtained.
- ii) Water curtain shall be obtained from adjacent hydrant header.
- iii) System components and equipment shall have materials of construction compatible with sea water.
- iv) System shall be operated by a remote electrical and manual system.
- v) A limit switch shall be provided on each MOV (Motor operated Valve) to control the valve operation.
- vi) The pressure switch shall be provided downstream of the last isolation valve on the header at the Jetty in order to register on the Main Panel (MP) a signal indicating "jetty water spray system on".

#### Technical Data

End connection : Flange to IS 6392, ANSI B 16.5 Class150

Finish : Natural finish or Epoxy painted

Material and Construction: Nozzles: SS - 316L.

#### 5.3.17 Fixed Water Spray System

A water spray network shall be designed in accordance with NFPA 15 .This system shall be located over the equipment areas and designed to provide water at the net rate as specified. The system comprises of piping, valves, sprayers and other accessories.

The density of water application by sprayers shall be 20.4 / 10.2 LPM / M2. For the effective protection of the areas, the risk area shall be divided into several zones of width not less than 10M. Each zone shall be so designed that the pressure at the hydraulically most un-favorable sprayer / sprinkler is not less than 1.4 bars and that the most favorable sprayer / sprinkler is not more than 3.5 bars and that the velocity in distribution pipes shall not exceed 5 m/sec.

Systems shall comprise of network of pipelines with distribution control, units, open spray nozzles- stainless steel material (capable of spraying water with medium velocity and high velocity), isolation valve. Water required for the system shall be drawn from fire network.

- i) Medium velocity water spray systems shall be provided to cover the valve manifolds at the jetty.
- ii) These systems shall cover the flanges and valves at the manifold with a fine spray of water producing diffusing effect.
- iii) The medium velocity spray nozzles shall operate within a pressure range of 1.4 to 3.5 kgs/cm<sup>2</sup> (g).



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iv) The medium velocity water spray systems shall be manual systems with 'Y' or 'T' type strainers provided downstream of the shut off valves.

v) Pressure switches /Flow switches/ Instrumentation to be provided to indicate / display in control room "MANIFOLD Spray System On"

## **FOAM SYSTEM**

### **5.3.18 Centralized Foam System & Inline Blender Proportioner**

The in-line balanced pressure proportioning system functions by maintaining an equal pressure in the foam concentrate and water inlets to the Proportioner. This balancing ability allows the proportioner to be used over a wide range of flows and pressures. The system will also respond quickly and accurately to changes in the water inlet pressures and flow rates.

The system utilizes a positive displacement gear foam pump to pressurize foam concentrate within the supply manifold. A pressure control valve, located in the return line to the foam concentrate storage tank, is set to maintain a regulated pressure in the supply manifold that is higher than the pressure in the water supply line. The foam concentrate that is not required by the proportioner is returned to the atmospheric storage tank through the pressure control valve. The spool valve senses the foam concentrate pressure and automatically adjusts to balance it with the water pressure. A duplex pressure gauge provides a reading of the foam concentrate and water pressures. The foam concentrate then enters the proportioner, where a built-in orifice regulates the flow of pressurized foam concentrate entering the water stream. The size shall be selected as per the design requirement depending upon use in Tower monitors etc. Each unit consists of a foam proportioner; pressure balancing spool valve; duplex gauge; various control, drain and check valves; manual foam balancing valve, interconnecting pipe and fittings; stainless steel braid flexible pressure sensing hoses; and valve identification nameplates.

In-line balanced pressure proportioners are used with an atmospheric foam concentrate tank and a positive displacement foam concentrate pump. In-line balanced pressure proportioners are designed to accurately control the flow of a foam liquid concentrate into a water stream over a wide range of flow rates and pressures.

The in-line balanced pressure proportioner assembly shall contain all necessary components including: foam proportioner; pressure balancing spool valve; duplex gauge; control, drain and check valves; interconnecting brass pipe; and valve identification nameplates. Balancing shall be accomplished through the use of a spool-type pressure balancing valve. This valve shall sense foam concentrate and water inlet pressures at the outer ends of a dumbbell-shaped piston and shall react to pressure changes by covering or uncovering the foam supply port to the proportioner. The in-line balanced pressure proportioner shall be completely pressure tested by the manufacturer. Pressure sensing hoses shall be Teflon with stainless braid cover and permanently attached couplings. Valve nameplates shall be provided and shall specify valve function and normal operating position. The "foam concentrate" ball valve shall have a ring pin and chain for securing the ball valve in the operating position.

### **5.3.19 Foam Tank Both are same**





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Foam tank shall be of SS 316LL material, fabricated construction and of suitable capacity. It shall have level indicator, manhole, vent, MS external access ladder and platform with MS supporting structure and necessary foundation. The manhole shall be of circular shape with a diameter of 300mm or as per the design.

The tank is to be installed at a height of one metre from finished ground level over MS saddles constructed on a civil foundation. The tank shall be erected in a slanting level with shim plates. The tank shall be provided with shed and a drain valve (Ball valve). Necessary pumping equipment, piping etc. for transferring foam concentrate into the tank from the foam barrels shall be provided.

Drain valves should be provided to clear the left over foam water in the system, after fire fighting. It is essential that the clear water shall be allowed, without foam induction into the system, for cleaning the pipe network of foam traces / residue.

The accessories/equipment which are fixed / mounted on the tanks are treated as part of the storage tank.

#### **5.3.20 Jetty Foam System**

Pressurized foam shall be pumped by foam concentrate pumps to be installed at Pump room.

The foam concentrate pumps shall be driven by Diesel / Electric motors. The running light indication of the pumps must be available at the Control Room. The foam tank shall have suitable vent connection. It shall have all the relevant instruments such as level gauge, high and low level alarms level switch, provision for dip stick, inlet, outlet, re-circulation and drain connections, as per requirements. The foam concentrate discharge header shall be normally charged but not pressurized, except when system is on demand. Flow indicators must be installed in the discharge header. The main foam pump must automatically operate immediately upon receipt of a signal initiated by the pedestal mounted push buttons station provided at the jetty.

The main foam pump must start within 5 seconds failing which second pump must start. Any one of these two pumps can be kept as main foam pump and the other one as standby. Starting of foam pumps should be able to be initiated by operation of push button systems located next to the pumps / control room/Tower monitor panel. Stopping of the foam pump sets shall be done manually only from the local control panel. Flow indicators must be installed in the system to monitor the quantity of foam fed into the system.

#### **5.3.21 Foam Supply Pumps, Tanks, Foam Piping:**

One electrically driven and one Diesel Driven foam pumps at pump house will be used to pump foam compound to the proportioner system near the base of tower monitors for injecting 3% - 6% of foam in main water lines Specifications of foam pumps and foam lines are described below.

#### **5.3.22 Gear Pump**



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Two (2) nos. gear pumps (one motor driven and other diesel engine driven) shall be provided at pump house. The design, material, construction, Manufacture, inspection, testing and performance of rotary gear pumps shall comply with all currently applicable standards. The pump and the electric motor/ diesel engine shall be factory assembled on welded steel base frame with suitable dowels etc. A built in relief valve with adjusted setting shall be provided on the pump casing. The gear pumps shall have external bearings. These external and friction heavy-duty bearings shall be capable of taking the pump thrust. Stuffing boxes shall be so designed that these can be replaced without removing any part other than the gland. Lantern rings, If used, shall be sandwiched between the packing rows and be easily removable.

Adequate space shall be provided between the pump drain connection and the base plate for installation of the drain piping. The pumps shall be supplied with suitable drain rim type base plate with tapped connections.

Coupling, guards, made of expanded metal and bolted to the base frame, shall be provided with all coupled pumps. The motor / engine horsepower shall be at least 120% of the brake horsepower of the pump at design point. Motor shall operate at 440 V, 3 phases, 50Hz power supply. The gear pumps shall have stainless steel name plate bearings details like year of manufacture, make model, rated discharge, rated discharge pressure, drive rating speed and weight.

### **Foam piping**

Material of construction: SS316L

#### **5.3.23 Foam Supply Tank:**

Foam supply tank of suitable capacity fabricated out of minimum 6mm thick stainless steel - 316L material shall be supplied and mounted on suitable supports. To give sufficient strength to the tank suitable baffles / reinforcement of stainless steel shall be provided. The tank shall have 450 mm dia. inspection manhole with cover, dished end and air vent. An overflow vent with isolation ball valve and suitable fixtures shall be provided to the tank. Dished end of tanks shall be without welding joint.

The tank shall have filler capacity of 150 mm dia with SS 316L strainer. A breather valve and a sludge trap shall, be fitted to the tank. The sludge trap shall have cleaning hole and 25mm dia drainpipe with an SS316L ball valve. The bottom of the tank shall have a slight slope towards the sludge trap. All the fittings, other components connected with tank shall be SS 316L.

Necessary lifting hooks shall be provided on the tank. The tank shall be fitted with level indicator with transparent graduated scale. The design, fabrication and testing of tank shall confirm to BIS 2825. The dished end of the tank shall be 100% radio graphed. The foam supply tank shall be calibrated. The calibration chart and the dipstick shall be supplied. The foam supply tank should have fill connection, concentrate supply connection to the pump, reverse flow connection to the tank from the pump, sump expansion dome, level indicator, air vent, drain valve and ladder. The fill connection shall have the strainer. Dip Sounding Flange to be provided for alternate sounding method.

Tank shall be provided with High level and low level alarms.



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## Material of Construction

### (a) Proportioner

i) Proportioner chamber bypass valve / Flange nuts, bolts and studs : SS-316L

### (b) Gear Pumps

i. Casing and end cover : SS-316L (CF8M)

ii. Rotor, Shaft, wearing ring : SS-316L

iii. Base plate : 316L(CF8M)

iv. Shaft Seal : Suitable for service

(c) Hand Pump (for foam transfer) : All stainless (SS-316L)

### 5.3.24 Foam Filling Pump.

Foam filling pump (electric & Diesel) driven shall be provided for pumping foam from drums/barrels/containers to foam supply tank. The contractor shall carry out necessary piping along with valves etc. from this pump to the tank. Material of Construction: SS-316L

### 5.3.25 MOTORISED VALVES:

a) The motor shall be flame proof 3-phase squirrel cage TEFC class F insulated (temperature rise limited to class B) IP 67 or higher enclosures both for motor and its terminal box, and with high starting torque. The duty cycle shall be S2- 600 cycles per hour. Wherever required and specially, for outdoor duty, the motor shall be provided with anti condensation heater.

b) Thermistor protection of motor with thermistor motor protection relay shall be provided, as required.

c) Each actuator shall be provided with extremely dependable both 'Open' and torque and / position limit switches. The torque and limit switches shall be provided with suitable means like mechanical selection, end position. The torque switch should not unnecessarily trip during initial unseating hammer blow effect. The anti hammer feature of the torque switch latch shall be available throughout travel including at end position. Once the torque switch has tripped in either direction, it can only be reset by operation of the actuator in the opposite direction. Each switch shall have 2 No + 2 NC potential free double break contacts. Switch contact rating on inductive Circuits shall be 5A AC at 240 V AC.

d) Actuator shall be provided with motor over-riding feature like hand wheel for emergency manual operation and a limit switch shall be provided whose contacts shall be used in the motor control circuit to forbid the motorized operation during manual operation by hand wheel. Also when the motor is switched 'ON', the hand wheel connection shall be discharged automatically, Motor operation shall always have priority over manual operation.

e) Internal wiring shall be tropical grade PVC insulated, stranded copper conductor cable of 10A rating for control circuits and required rating for motor. All wires shall be clearly numbered



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at both the terminal block and component ends. The Voltage grade of cables/wires shall be 1100 V terminals shall be segregated from the control terminals by means of an insulating cover. Separate terminal box fitted to switching unit shall be provided. The terminal box shall be designed for the protection class of IP - 65 inside of the terminal shall be provided attached to the inside of the terminal box cover indicating serial number, external voltage values, wiring diagram number and terminal layout.

f) The actuator shall be suitable for operation at specified ambient temperature. All actuators whether for explosion/hazardous locations or not, shall be neoprene O-ring sealed water tight and dust proof to IP-67 protection and shall at the same time have an inner watertight neoprene O-ring seal between the terminal box and the internal electrical elements of the actuator, fully protecting the switch mechanism, motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal box cover is removed on site for cabling / maintenance. Actuators for explosion /hazardous application shall in addition be certified explosion proof of specified class group and division.

g) The actuators shall be operated from the control desk Local Control Station (LCS) shall be provided separately for local operation of the actuator for testing and maintenance purpose. Isolator along with starter for the actuator motor shall be located in the MMC. Separate power cable shall be used for motor wiring.

### 5.3.26 CONTROL PHILOSOPHY

Each drive shall motor have manual, remote and local controls at the jetty head. Remote control operation of equipment/mechanism shall be accomplished from control room. Local control shall be accomplished from dedicated local control station installed near the corresponding drive motor/mechanism. Control selector switches for selection of manual, Remote & Local controls for each drive motor/mechanism shall be on control desk (located at control room).

All the control panels shall be designed in respect of fire safety provision considering the installation in the inflammable zone with provisions of volatile aerosols/ fumes as per the latest IS standards/norms applicable for Oil and Gas industries.

### 5.3.27 EOT crane

E.O.T Crane of Suitable capacity shall be supplied and installed with the following technical specification confirming to IS 807& IS 3177

Capacity	:	10 T
Girder construction	:	Single Girder
Duty/ Class	:	Medium & Indoor
Span	:	During Detail Engineering.
Height of Lift	:	During Detail Engineering.

### 5.3.28 International Shore Connection.



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One no. International shore connection on each jetty shall be provided with isolation valve on service platform wherever required.

#### **5.3.29 Flame Detection System**

The flame detector shall be combination of ultra-violet and infrared radiation type and shall be able to response instantaneous level of radiation received. A flame detector shall be located at specific point such as unloading arms discharge end, piping manifolds, and valves in the jetty area to detect ultra violet and infra red radiation emitted due to flames.

The location of flame detectors shall also be such that their line of sight is not impede by structural members or any other opaque objects or materials and shall be as close to the source of fire as possible so as to detect fire quickly. The system will be linked to control room where audiovisual signal will be provided if flame is detected in jetty area. Flame detectors are required to be installed in the Jetty with a control module in control room.

Addressable Microprocessor Controlled UV / IR Flame Detectors compatible with the Main Fire Alarm Panel and UL Listed/approved by FM. The Detector and the Controller shall be housed in a single Explosion Proof Enclosure. It should have sensitivity so that it will respond to 1 Sq. Ft. of Gasoline Fire at 50 Ft. It should have 0.5 or 3 second selectable Response Time settings.

#### **5.3.30 Gas Detection System.**

A gas detection system shall be provided to give warning of the presence of flammable gases or vapor in air, well before they reach explosive concentrations. Suitable sensors shall be installed at critical places such as unloading area / valve manifold area in the jetty head to continuously monitor the flammable gas concentration at strategic locations and the same shall be linked to the control room for audio visual alarm in addition continuous detection.

The sensors shall sense the concentration and indicate the level in the control room by suitable audio / visual warning when gas concentrations exceed predetermined levels.


Fire alarm/gas detection is to be provided as per OISD requirement. Automatic Fire Detection & Alarm system with Suitable Detectors at oil Jetty, manifold, and fire alarm panel to be provided at Centralized control room.

#### **5.3.31 Public Address System**

A Public address system linking various functional locations on the jetty area shall be provided. The loud speakers shall be located on strategic locations, pump house service platform, rest room etc. The announcing facility shall be located in the control room. All the electrical/ electronic components shall be flame proof and intrinsically safe. Outdoor equipment / components must be weatherproof.

#### **5.3.32 Control Panel For Oil Jetty**

The scope of work shall include Design, Supply, Installation and Testing of intrinsically safe electrical system for remote operation to tower foam / water monitor / pump sets / valves / foam skid / Jumbo Curtain Nozzles and other equipment installed at Pump House and Jetty with

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complete remote control panel with joystick controls including control cable, power cable with annunciators shall be installed on Control Desk.

The Control panel shall be located at the Control room of OJ 8 pump house.

The entire Control shall be provided with air conditioning equipment. The glass panels shall be shatter proof tilted type. The control room shall have emergency power fed by DG. The main / local fire alarm control panel and loop devices including sensors, 'Interface & relay units Addressable UV/IR Flame Detectors should be sourced from the same ISO 9000 certified manufacturer to ensure perfect compatibility between hardware and software.

All basic equipment's proposed and planned for use shall be formally approved by any National / International authorities. At least one national/ internationally recognized testing labs and/or approval from all the concerned authority for the system offered.

**Main Panel shall have features like:**

- i) Field selectable signal silence inhibit
- ii) Software based field programmable (per circuit) selective zoned PNIS coded, temporal coded, March time coded or master coded operation
- iii) Alarm / trouble resound
- iv) Supervised serial annunciation connection.
- v) Built-in-alarm verification tally for alarm verification zones.
- vi) Optional remote serial (two-wire) alarm and trouble annunciation with optional acknowledge and reset switch, trouble light and trouble signal silence switch.
- vii) A Safety alarm and Safety Cutout for low pressure 6.5Kg/cm<sup>2</sup> and high pressure 16.5 Kg/cm<sup>2</sup>. Indicator for Valve closing, Jockey pump operation, Fault, System Stopped for Tower monitor, Ground Monitor, Jumbo Curtain nozzles, all motorized valves, Water spray system, Manifolds, Interconnection failure for other systems shall be provided in control room and also local control for the above items are to be provided. Indicator Foam Tank Level Indicator.

**5.3.33 Remote Control System:**

Remote control joy stick is required to be provided for rotation of foam/ water monitors in horizontal and vertical planes. The rotation of monitors is to be controlled from control room. The remote control system shall be operated electrically and should be compatible with the monitor offered. The Equipments used for remote control system, shall be explosion proof and the wiring shall be by the heat resistant cables. The essence of the working of the monitors depends upon the reliability of this system. Therefore, the latest practices to increase its reliability must be adopted. The remote control system should also control the electrically operated valves in the tower monitors lines and the hydrant/water curtain. The foam injection system also should be controlled by this system. The interconnecting cables between the control panel and motorized valves at the jetty area shall be fire survival type.





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The electric remote control panel in the control room shall have the necessary controls for the following operations. The controls provided on the remote control desk shall be as below.

- i) Auto/ Manual selection of monitor, hydrant & Jockey pumps.
- ii) Manual start / Stop of all pump sets including foam pumps
- iii) Joystick control of Tower monitors
- iv) Manual start / Stop of all electrical operated valves.
- v) Fog to jet control of Tower monitors
- vi) Master selector switch for local or remote start for all pumps
- vii) ON/OFF for all pumps sets
- viii) OPEN/CLOSE for all electrical operated valves
- ix) Position of Tower monitors
- x) Pressure in monitors & Hydrants mains.
- xi) Signal & Alarm for Flame Detectors/LEL detectors etc.

A mimic diagram shall be provided on the control desk.

### **5.3.34 Surface Preparation & Painting**

#### **Procedure of Surface Preparation**

##### **Air Blast Cleaning**

For non-galvanized pipes, the blast cleaning of the surfaces shall be done using abrasive media like Al<sub>2</sub>O<sub>3</sub> particles, copper slag, or other standard media at a pressure of 7 kg/cm<sup>2</sup> at appropriate distance and angle depending on nozzle size maintaining constant velocity and pressure.

Compressed air shall be free from moisture and oil. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the materials for liners. Nozzles orifice may vary from 3/16" to 3/4".

On completion of blasting operation, the blasted surface shall be clean and free from any scale or rust and must show a gray white metallic lustre. Primer shall be applied within 4 hours of surface preparation.

Blast cleaning shall not be done outdoors in bad weather without adequate protection or when there is dew on the metal which is to be cleaned. Surface profile shall be uniform to provide good key to the paint adhesion (i.e. 35 to 50 micron). If possible vacuum collector, shall be installed for collecting the abrasives and recycling.

##### **Coating Procedure and Application:**



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Surface shall not be coated in rain, wind or in environment where injurious airborne elements exists, when the steel surface temperature is less than 5 deg.F above dew point, when the relative humidity is greater than 85% or when the temperature is below 40 0F.

Blast cleaned surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hrs.

Each coat of material shall be applied as a continuous uniform film thickness, free of pores. Any spots or areas missed in application shall be recoated and left to dry before the next coat is applied. Applied paint should have the desired wet film thickness.

Each coat shall be in proper state of cure or dryness before the application of succeeding coat. Material shall be considered dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting or loss of adhesion of the under coat. Manufacturer instruction shall be followed for inter coat interval.

When the successive coat of the same colour have been specified, alternate coat shall be tinted, when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface. The tinting material shall be compatible with the material and not detrimental to its service life.

Airless spray application shall be as per steel structure paint Manual Vol.1 & Vol.2 by SSPC, USA. Air less spray relies on hydraulic pressure rather than air atomization to produce the desired spray. An air compressor or electric motor is used to operate a pump to produce pressures of 1,000 to 6,000 psi. Paint is delivered to the spray gun at this pressure through a single hose within the gun, a single paint stream is divided into separate streams, which are forced through a small orifice resulting in atomization of paint without the use of air. This results in more rapid coverage with less over spray.

Airless spray equipment is mounted on wheels, and paint is aspirated in a hose that sucks paint from the containers. The unit shall have inbuilt agitator that keep the paint uniformly mixed during the spraying. The unit shall consists of inbuilt strainer. Usually very small quantities of thinning is required before spray. Fluid hoses should not be less than 3/8" ID and not longer than 50' to Obtain optimum results.

Brush application of paint shall be in accordance with the following:

- a. Brushes shall be of a style and quality that will enable proper application of paint.
- b. Round or oval brushes are most suitable for rivets, bolts, gratings, irregular surfaces, and rough or pitted steel. Wide flat brushes are suitable for large flat areas, but they shall not have width over 125 mm.
- c. Paint shall be applied into all corners.
- d. Any runs or sags shall be brushed out.
- e. There shall be a minimum of brush marks left on the painted surface



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For each coat the painter should know the WFT corresponding to the specified DFT and standardize the paint application technique to achieve the desired WFT. This has to be ensured in the qualification trial.

A circumferential protection screen to be erected around the tank to physically prevent dust from entering the painting area as the sites are prone to dusty winds.

### **Drying of coated Surfaces**

No coat shall be applied until the preceding coat has dried. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of undercoats. Drying time of the applied coat should not exceed maximum specified if it is a first coat; if it exceeds the paint material has possibly deteriorated or mixing is faulty.

No paint shall be force dried under conditions which will cause wrinkling, blistering, formation of pores, or detrimentally affect the condition of the paint.

No drying agent shall be added to a paint on the job unless specifically called for in the manufacturer's specification for the paint.

Paint shall be protected from rain, condensation, contamination, snow and freezing until dry to the fullest extent practicable.

### **Paint application**

Painting shall be done by airless spray otherwise, where allowed, brush (of maximum width 125 mm) can be used.

### **5.3.35 Brief Scope of Work**

Sl.No	Description of Item
1.0	PLANT PIPING FABRICATION, ERECTION, INSTALLATION, AND TESTING OF PIPING :



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	<p>Complete work of supply, fabrication, erection, installation, painting, testing of pipes including all taxes, duties, transportation and inspection charges but not limited to, the following items in accordance with relevant specifications indicated in scope of work, indicated in SCC, drawings, instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. Performing all above ground and below ground (where ever necessary with sufficient protection) piping fabrication works including cutting, edge preparation (inclusive of grinding the edges of pipes, fittings etc. to match with the matching edges of uneven/ different thickness wherever required), fit up, bending, pre-heating wherever required, welding, threading etc.; fabrication of fittings like miter bends, tees, reducers etc. is in the scope of contractor and erection of the same, erection of pipes of all types and thickness over sleepers, overhead on racks and at all elevations; hook-up with existing header, equipments etc. Erection of fittings of all sizes and types i.e. elbows, reducers, tees, half coupling etc cleaning and flushing, carrying out hydrostatic test, carrying out 10% non-destructive testing of each size such as radiography by gamma ray, magnetic particle, liquid penetration etc., carrying out repairs if any and re-radiography, pre-commissioning and commissioning; clean-up and restoration of site, preparation of as built drawings, documents and project records. Completing all works in all respects as per the GFC drawings, specifications, standards and other provisions of Contract and instruction of Engineer-in-Charge. MCU Painting of pipeline &amp; fittings as per Employer's specification. Supply of paints, solvents and primers, preparation of surfaces by sand/grit blasting using one of the abrasives and application of Zinc Ethyl Silicate Primer (P1- One coat @ 75 microns DFT / coat), Two pack epoxy – polyamid mio Intermediate / undercoat paint (U1- One coat @ 100 microns DFT/coat minimum) and Two pack aliphatic acrylic polyurethane finish paint ( F2-Two Coats @ 40 microns DFT /coat minimum) suitable for normal corrosive painting environment. Identification, lettering/ numbering, colour coding and colour bands as per Industry Quality Control manual etc. as specified including rub down and touch up of shop primer or scrapping of shop primer wherever required and providing of scaffolding for all heights, labour, materials, tools and tackles, consumables, supervision etc. to complete the work in all respect as per Specification, Drawings, Standards and Instruction of Engineer-in-Charge. Painting shall be done by spray only. M.S. Pipes (Cement Lined) ERW</p>
2	<p><b>SUPPLY &amp; ERECTION OF FLANGES</b> Complete work of Supply of Raised Face (RF) Flange Sets including all taxes, duties, transportation and inspection charges but not limited to, the following items in accordance with relevant specifications indicated in scope of work, indicated in SCC, drawings, specification, instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. (One Set consists of 2 Nos RF Flanges). Complete work of Handling including lifting and transportation from storage yard to work site of all types and sizes of flanges erection on pipelines, at all locations (a/g and u/g ) including bolting, gaskets, alignment, fit-up, welding, including supply &amp; erection of gaskets, supply &amp; erection of nuts &amp; bolts, supply of all consumables, manpower, equipment etc, for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge (one set consists of 2 Nos RF Flanges with Gaskets, Nuts &amp; bolts)</p>



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3	SUPPLY & ERECTION OF VALVES Complete work of supply of valves (M.O.C.-CS or higher in case of ERW & SS valve in case of SS pipe) including supply of matching companion flanges including transportation to store and inspection charges but not limited to, the following items in accordance with relevant specifications indicated in scope of work, SCC, drawings, specifications, instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. Handling including lifting and transportation from storage yard to work site and installation of all types of valves at all locations (UG/AG) by bolting, threading or welding including erection of matching companion flanges, supply & erection of gaskets, supply & erection of nuts & bolts, alignment, fit-up, welding etc. at all elevations of pipe sleepers, supports or overhead on racks, equipments nozzle, pumps & painting etc. supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning of valves wherever required.
4	SUPPLY & ERECTION OF T/Y TYPE STRAINERS Design, Engineering, Manufacturing, Testing, Inspection, supply including Packaging, Forwarding, Transportation to store of "Y / T" type strainer with CS body & SS strainer including supply of matching companion flange as per approved Drg./ Data Sheet/ PJS etc but not limited to, the following in accordance with relevant specifications indicated in PJS, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT as per details below. Erection, testing & commissioning of "Y / T" type strainer with cast Steel body & SS strainer including erection of companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, alignment, fit-up, welding etc
5	Complete work of supply of suitable Orifice plate for reducing the pressure from 8-10 kg/sq.cm to 2.5-4 kg/sq cm in accordance with relevant Specifications & relevant Data Sheets indicated in scope of work, indicated in SCC, drawings, specification and instructions of EIC and as per all provisions of the CONTRACT DOCUMENT. Handling including lifting and transportation from storage yard to work site and installation/Insertion of restricted orifice Supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer in-charge.
6	HYDRANT SYSTEM (design, engineering, supply & erection) Complete work of Design, Engineering, Supply & Erection including transportation from store but not limited to, the following items in accordance with relevant specifications indicated in scope of work, SCC, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT
6.1	2 way stand post type hydrant with two nos. single outlet 100 mm inlet bronze landing valve (conforming to IS: 5290: 1993 - type -A) with matching flanges (Conforming to IS: 6392 Table-17 / ANSI B 16.5), with control fitted with 63 mm dia instantaneous female coupling on the outlet complete with orifice flange as required for network pressure ranging from 9 to 10.5 Kg/cm <sup>2</sup> , blank cap and chain. Bolts, nuts and gaskets, etc., complete as per data sheet & technical specification. (1 set consists of 2 nos of single valves with stand post & matching flange 4" size, gaskets, nut & bolt all complete). The assembly shall be suitable for direct erection over companion flange on branch outlet from main header. Handling including lifting





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	and transportation from storage yard to work site and installation by bolting, threading or welding, including erection of matching companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required
<b>6.2</b>	2580 LPM stand post type water cum foam monitor (as per IS : 8442 : 2008, UL Listed / FM Approved) as per Data sheet & Technical Specification with jet / spray nozzle with drain provision and all other accessories including suitable orifice plate for network pressure ranging from 8 to 10.5 Kg/cm <sup>2</sup> and matching flanges of 4" size confirming to IS: 6392 Table - 17, bolts, nuts and gaskets complete including painting as specified & directed by EIC. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and installation by bolting, threading or welding, including erection of matching companion flanges, supply & erection/insertion of gaskets, supply & erection of nuts & bolts, supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required
<b>6.3</b>	FRP fire hose cabinet suitable for accommodating 2 nos of 15 mtrs long canvas hose with coupling, branch pipe and nozzle for external hydrants with double glass door, lock & key including outdoor mounting arrangement complete as specified. Handling including lifting and transportation from Owner's/ Contractor's own storage yard to work site and Erection of FRP fire hose cabinet including supply of all consumables, manpower, equipment, supply & erection of nuts & bolts, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer-in-charge including servicing/ cleaning wherever required.
<b>6.4</b>	63 mm dia 15 m long RRL Hose including gunmetal male and female instantaneous type coupling , machine wound with GI wire complete in all respects. Hose to IS:636 type A, UL Listed / FM Approved and coupling to IS:903:1984 with ISI certification. (One set consists of 2 nos each of 15m length)
<b>7</b>	Supply, Erection, Testing & Commissioning of Fire Pump Co-ordination Panel which will receive signal from two fire main / standby pumps and one jockey pumps for start / stop through pressure transmitter and onward transmission of digital output signal to main control room including receiving remote signal from the plant control room, all fire water tanks level indication provision, associated instruments including termination of cables.
<b>8</b>	Supply, Erection, Testing and commissioning including handling , Lifting & transportation from stores of gear pump for centralized foam system as per approved Drg./ Data Sheet/ PJS etc but not limited to, the following in accordance with relevant specifications indicated in PJS, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT. Supply & Erection of Complete Pump sets with electric motor, Cable, common base frame, coupling, coupling guard, foundation bolts, nuts and





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	gaskets, electrics, instrumentation, cable laying, panels , consumables, etc. Erection of matching flanges (conforming to IS:6392 table - 17) , Supply & Erection of SS bolts, nuts, Supply & erection of gaskets. Assembly of parts/ sub-assemblies erection of interconnection piping, placing / erecting the equipments supplied by company above ground at all elevation, fixing of foundation bolts welding wherever required, levelling, aligning, grouting with non-shrink grout material including chipping and dressing of foundation, carrying out trial runs and providing man power for testing, trial and start -up runs rectifying defects if any and completing the work in all respect as per drawing and specification, manufacturer's installation manual, general specification for erection of Rotating Equipment enclosed and instruction of Engineer-in-charge.
<b>9</b>	FOAM SYSTEM, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING & COMMISSIONING of foam concentrate tank and associated system comprising of Foam concentrate tank to hold foam with lid and locking arrangement, vent pipe, fill pipe, level/volume indicator, drain line with valve, manhole, cleaning line with valve, two nos. of lines with valve in vertical portion, nozzles with matching companion flanges, Supply & Erection of bolts, nuts, Supply & erection of gaskets etc as complete including Foam concentrate outlets in SS 304 for the foam inductor with the control Ball valve of SS 304 grade for the following capacities.
<b>9.1</b>	Foam storage SS tank of Capacity 28000L
<b>10</b>	Supply, Erection, Testing & Commissioning of 10T Single Girder EOT Crane at pump house
<b>11</b>	Supply, Erection, testing and commissioning of Inline Blender Proportioner for Fixed Foam System , supply along with Erection of matching flanges (conforming to IS:6392 table - 17) , Supply & Erection of bolts, nuts, Supply & erection of gaskets complete as per the technical specification .The facilities provided shall meet the stipulations of OISD / technical specification and direction of engineer-in-charge / site incharge.
<b>12</b>	Supply & Erection of SS coupling (pair of male & female) for flexible pickup tube connections with pipe
<b>13</b>	Supply & Erection of foam pickup flexible tube for fixed foam system
<b>14</b>	Supply, Erection, Testing & Commissioning of Tower Monitors along with Remote operation Mechanism, Motor Operated Isolation Valve, Foam induction system & Flame Proof Control Panel etc, Supply & Erection of matching flanges , Supply & Erection of bolts, nuts, Supply& erection of gaskets, for tank fire protection in dyke area including fulfillment of guarantee of the system as specified in TS.
<b>15</b>	Supply, Erection, Testing & Commissioning of water curtain Jumbo Nozzle's , Supply & Erection of matching flanges , Supply& Erection of bolts, nuts, Supply& erection of gaskets, for tank fire protection in dyke area including fulfillment of guarantee of the system as specified in TS.



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<b>16</b>	Clean Gas/CO2 Fire Suppression Centralized System complete with required accessories & each cylinder field with Clean agent/CO2 Fire extinguishing Agent as Main Bank and Standby Bank (Make UL listed) with Directional Valve, Pressure Switch with Locking Device, Discharge Nozzles designed to provide the proper flow rate and distribution of clean Agent/ CO2 to total flood hazard area: 180 deg/360 deg. (Make UL listed) ASTM A106 Gr. B piping, fittings & Supports etc. manifold fabricated from seamless pipe A106 Gr. B having inlets with supports etc. with activation through intelligent addressable fire Detection and Alarm Systems as per approved scheme work shall be carried out as TS.
<b>17</b>	Intelligent addressable Fire Detection and Alarm System as with fire alarm cum gas release panels, detectors, response indicators, cabling etc. all complete as per approved scheme. Work shall be carried out as per DPT TS No. Complete work of supply includes transportation to store and from store to work site and inspection charges but not limited to, the following items in accordance with relevant Specifications & relevant Data Sheets indicated in scope of work, SCC, drawings, specification and instructions of EIC and as per all provisions of the CONTRACT DOCUMENT. The area of control rooms to be protected are listed below:
<b>18</b>	Portable Fire Extinguishers:
	Supply of Dry Chemical Powder type fire extinguisher suitable for inverted operation with anticorrosive treatment and hydraulically tested to a pressure of 25 kg/ sq.cm . Extinguishers externally painted with red enamel and fixed to wall with brackets complete with internal charge and spanner complete
<b>18.1</b>	DCP – 9Kg ( IS:15683)
<b>18.2</b>	DCP – 75Kg -TM ( IS:10658 )
<b>19</b>	Supply of CO2 type fire extinguishers with steel cylinder with discharge valve and conforming to IS:15683. Extinguisher shall be painted with red enamel paint. (Capacity - 4.5Kg)
<b>20</b>	Supply of galvanized steel set of 4 fire buckets (9 Ltrs. Cap) suitable technical specification and confirming to IS: 2546-1974 RA2000. Buckets shall be painted with red enamel paint and fixed to suitable location
<b>21</b>	Supply of M S stand with cover/ hood for Keeping the out door fire extinguishers
<b>22</b>	Foam solution as per tender specifications confirming to IS-4989 part-II & UL listed 3% concentrate filled in 200/210 ltr HDPE barrels
<b>23</b>	INDICATIVE SAFETY EQUIPMENT
<b>23a</b>	Jet Nozzles with branch pipe (IS 903)
<b>23b</b>	Fog Nozzles (IS-952)
<b>23c</b>	Universal Nozzles (IS-2871)



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<b>23d</b>	Water Curtains (IS 903)
<b>23e</b>	Foam Making Branch Pipes IS 2097-1983 RA 2020
<b>23f</b>	Nozzle Spanner (IS 903)
<b>23g</b>	Sand drum with sand scoop
<b>23h</b>	Safety Helmet- IS-2925-1984 RA 2000
<b>23i</b>	Stretcher with blanket Is-4037-1967 RA-2001
<b>23j</b>	First Aid box
<b>23k</b>	Rubber Hand Gloves IS-4770-1991 RA-2001
<b>23l</b>	Explosimeter
<b>23m</b>	Fire proximity suit
<b>23n</b>	Resuscitator IS-6194-1971 RA-2006
<b>23o</b>	Electric siren(3km range) IS: 1941-1971 RA-2006
<b>23p</b>	Hand operated siren IS: 6194-1971 RA-2006
<b>23q</b>	Water gel blanket
<b>23r</b>	Red & Green flag for fire drill
<b>23s</b>	Escape type self contained breathing apparatus(SCBA) for 30 minutes capacity IS: 10245(part-IV) - 982 with a spare cylinder
<b>23t</b>	Low Temperature Gloves for Handling LPG/Cryogenic Liquids/gases
<b>23u</b>	H2S Gas Detectors

## PAINTING MATERIAL SPECIFICATION

The paint materials designated shall meet the following specifications.

### I. PRIMERS:

#### 1. INORGANIC ZINC SILICATE: (P1)

a) Type & Composition	:	A Two pack air drying self curing solvent based inorganic zinc silicate coating
b) Volume solids (approximately)	:	60%
c) DFT (Dry Film Thickness)	:	75 microns
d) Weight per liter in kgs / liter (app.)	:	2.3
e) Touch dry at 30°C (approximately)	:	30 minutes
f) Hard dry at 30°C (approximately)	:	12 Hours



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g) Over-coating interval : Minimum :- 8Hours at 20°C and 50%RH  
Maximum :- Unlimited

## 2. EPOXY ZINC PHOSPHATE PRIMER: (P2)

a) Type & Composition : Two component polyamide cured epoxy resin medium, pigmented with zinc phosphate

b) Volume solids (approximately) : 40%

c) DFT(Dry film thickness) : 60 microns

d) Weight per litre in kgs / litre (app.) : 1.4

e) Touch dry at 30°C (approximately) : After 30 minutes

f) Hard dry at 30°C (approximately) : Minimum :- 8 Hours  
Maximum :- 3-6 months

g) Overcoating interval : Minimum :- 8Hours  
Maximum :- 3-6 months

## II. INTERMEDIATE / UNDERCOAT PAINTS:

### 1. EPOXY-HIGH BUILD MIO UNDERCOAT: (U1)

a) Type & Composition : A Two pack Polyamide cured epoxy resin medium suitably pigmented with MIO

b) Volume solids (approximately) : 60%

c) DFT(Dry film thickness) : 100 microns

d) Touch dry at 30°C (approximately) : 3 Hours

e) Hard dry at 30°C (approximately) : Overnight

f) Overcoating interval : Minimum :- Overnight  
Maximum :- 2 Days

## III. FINISH PAINTS:

### 1. EPOXY-HIGH BUILD FINISH PAINT: (F1)

a) Type & Composition : A Two pack Polyamide/Polyamine cured epoxy resin medium suitably pigmented

b) Volume solids (approximately) : 62%

c) DFT(Dry film thickness) : 100 microns

d) Weight per litre in kgs / litre (app.) : 1.4



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- |   |   |   |
|---|---|---|
| e) Touch dry at 30 <sup>0</sup> c (approximately) | : | 3 Hours                                   |
| f) Hard dry at 30 <sup>0</sup> c (approximately)  | : | Overnight                                 |
| g) Overcoating interval                           | : | Minimum :- Overnight<br>Maximum :- 5 Days |

## 2.ACRYLIC POLYURETHANE FINISH PAINT: (F2)

- |   |   |  |
|---|---|--|
| a) Type & Composition                             | : | Two pack aliphatic isocyanate cured acrylic polyurethane finish paint. |
| b) Volume solids (approximately)                  | : | 40%  |
| c) DFT(Dry film thickness)                        | : | 40 microns   |
| d) Weight per litre in kgs / litre (app.)         | : | 1.3  |
| e) Touch dry at 30 <sup>0</sup> c (approximately) | : | One Hour   |
| f) Hard dry at 30 <sup>0</sup> c (approximately)  | : | Overnight  |
| g) Overcoating interval                           | : | Minimum :- Overnight (12 Hours )<br>Maximum :- Unlimited               |

## 3. COAL TAR EPOXY: (F3)

A high build two component epoxy coal-tar product meant for excellent performance total / partial / intermittent immersion conditions in salt or fresh water. It is a blend of epoxy and coal-tar pitch in suitable ratios.

- |                           |   |   |
|---------------------------|---|---|
| Type of epoxy             | : | Condensation product of bisphenol A and epichlorohydrin with terminal Epoxide groups              |
| Curing agent              | : | Polyamide   |
| Volume solids             | : | 65 %  |
| Application               | : | By brush or airless spray   |
| Dry film thickness / coat | : | 100 microns   |
| Drying time               | : | Touch dry – overnight dependent on Ambient temperature and ventilation.<br>Hard dry in 48 hours.  |
| Overcoating time          | : | 1 – 3 days. This should be very strictly adhered to in order to avoid peeling of subsequent coat. |

## 4. SYNTHETIC ENAMEL (F4)



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A high quality enamel based on synthetic resin vehicle stable weather resistant pigment designed for both protection and decoration.

Volume solids	:	38 – 40%
Application	:	By brush or airless spray
Dry film thickness / coat	:	25 microns
Spreading rate (Theoretical)	:	15 sqm / l
Drying time	:	Surface dry – 4 hrs. Hard dry – in 18 hours

## **6.0 DESIGN CRITERIA**

### **Codes and Standards:**

All materials, equipments, piping, valves, fittings etc. dimensional standards, tolerance, prices of manufacture and testing procedure shall be in accordance with the latest revision of relevant Indian, British, American standards wherever applicable.

The material used and equipment supplied shall be new and the best of their kind and shall comply with the latest revisions of all relevant standards. The tenderer shall indicate in his tender the relevant standards to which the equipment, piping, fittings, etc. offered by him shall comply with. The latest revisions of applicable standards indicated in the technical specification shall be used for the design, manufacture, inspecting and testing of the items covered in this specification. The following codes and standards shall be considered for design: -

- OISD-113: Classification of areas for electrical installations at hydrocarbon processing and handling facilities.
- OISD-118: Layout for oil and gas installation.
- OISD-117: Fire Protection Facilities for Petroleum Depots, Terminals, Pipeline Installations and Lube Oil Installations
- OISD-189: Standard on Fire Fighting Equipment for Drilling Rigs, Work Over Rigs and Production Installations.
- OISD-163 : Safety of Control room for Hydro-carbon Industry
- National fire protection association, USA (NFPA) codes
- Standard for installation of centrifugal pumps (NFPA-20)
- Standard for water spray systems (NFPA- 15)
- Standard for sprinkler systems (NFPA-13)
- Single faced sluice gates IS:3042-1965
- Single faced cast iron thimble mounted sluice gates IS:13349-1992
- Sluice valves for water works purpose (50-300mm size) IS: 780-1984





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- Copper alloy gate, globe and check valves for general purpose. IS:778-1984
- Specification for cast iron check valves BS 5153-1991
- Foot valves for water works purposes IS:4038-1986
- Landing valves IS:5290-1993
- Valve inspection & test IS:6157-1981
- Specification for inspection and test of steel valves BS:6755-1986
- Mild steel tubes, tubular and other wrought iron fittings IS:1239, part-1-1990 & Part-2-1992
- Seamless or electrically welded steel pipes for water, gas and sewage IS:3589-1991
- Steel pipe flanges for water, oil, steam etc. IS:6392-1971
- Butt welded fittings ANSI B16.9
- Circular flanges for pipes, valves and fittings BS1560-latest editions
- Code for pressure piping ANSI B31.1
- Steel pipe flanges ANSI B 16.5
- Code of practice for laying of electrically welded steel pipes for water supply IS:5822-1994
- Excavation work-code of safety IS: 3764-1992
- Criteria for design of anchor blocks for penstock with expansion joints IS:5330-1984
- Covered electrode for manual metal arc welding of carbon and carbon manganese steel IS:8141991
- Approved tests for welding procedure IS: 7307 (Part-I)-1974
- Approved tests for welders working to approved welding procedures IS:7310(Part-I)-1974
- Specification for arc welding of carbon and carbon manganese steels BS:5135-1984
- Code of practice for coating & wrapping IS:10221
- Code of practice for radiographic testing IS:2595-1978
- Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes IS:4853-1982
- Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes IS:1182-1983
- Safety code for industrial radiographic practice IS:2598-1966
- Ready mixed paint, stoving, red-oxide-zinc chrome priming IS:2074-1992
- Code of practice for painting of ferrous metals in building IS:1477-1971
- Colors for ready mixed paints and enamels IS:5-1994
- Steel for general structural purposes IS:2062-1992



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## **LIST OF SUPPLIERS OF ITEMS**

### **i) PIPE CARBON STEEL TO INDIAN STANDARDS**

- 1 A.S.T. PIPES PVT. LTD. (AST GROUP)
- 2 ADVANCE STEEL TUBE LTD.
- 3 APL APOLLO TUBES LTD. (ER. BIHAR TUBES LTD.
- 4 ASRANI TUBES LIMITED
- 5 DADU PIPES (P) LTD.
- 6 ESSAR STEEL LIMITED(ER HAZIRA PIPES MILL)
- 7 GAURANG PRODUCTS PVT LTD. (AST GROUP)
- 8 GOODLUCK STEEL TUBES LTD.
- 9 HI-TECH PIPES LIMITED
- 10 INDUS TUBE LIMITED
- 11 JINDAL INDUSTRIES LTD
- 12 JINDAL PIPES LTD.



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- 13 JINDAL SAW LTD (KOSI WORKS)
- 14 JOTINDRA STEEL & TUBE LTD
- 15 LALIT PIPES AND PIPES LTD.
- 16 MAHARASHTRA SEAMLESS LTD.
- 17 MAN INDUSTRIES (INDIA) LTD. – PITHAMPUR
- 18 MAN INDUSTRIES (INDIA) LTD. ANJAR
- 19 MUKAT TANKS & VESSELS LTD.
- 20 NEZONE TUBES LIMITED
- 21 NORTH EASTERN TUBES LIMITED
- 22 PRATIBHA INDUSTRIES LIMITED
- 23 PRATIBHA PIPES & STRUCTURAL LTD.
- 24 PSL LTD (CHENNAI)
- 25 PSL LTD (V1, V2 & NC)
- 26 RAMA STEEL TUBES LTD.
- 27 RATNAMANI METALS AND TUBES LTD.
- 28 RAVINDRA TUBES LIMITED
- 29 SAMSHI PIPE INDUSTRIES LIMITED
- 30 SURYA ROSHNI LTD.
- 31 SWASTIK PIPES LTD.
- 32 UTKARSH TUBES & PIPES LTD. (FORMLY BMW)
- 33 WELSPUN CORP. LIMITED (DAHEJ)
- 34 ZENITH BIRLA (INDIA) LIMITED

## ii) PIPE & TUBULARS TO A.P.I. STANDARDS

1. ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA, ROMANIA
2. BHEL (TRICHY),INDIA
3. DALMINE SPA (ENQUIRY TO TENARIS),UAE
4. EEWKOREA CO. LTD (GERMANY), KOREA
5. EEW KOREA CO. LTD. (KOREA), KOREA
6. EISENBAU KRAMER GMBH, GERMANY
7. HYUNDAI RB CO. LTD. SOUTH KOREA
8. ILVA LAMIERE E TUBI SRL (ENQ TO ILVA SPA, ITALY)
9. INOX TECH. SPA, ITALY



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10. ISMT LTD. AHMEDNDR, INDIA
11. ISMT LTD. BARAMATI, INDIA
12. JINDAL PIPES LTD., INDIA
13. JINDAL SAW LTD. (KOSI WORKS), INDIA
14. JINDAL SAW LTD. (NASHIK WORKS), INDIA
15. LALIT PIPES AND PIPES LTD. INDIA
16. MAHARASHTRA SEAMLESS LTD., INDIA
17. MAN INDUSTRIES (I) LTD. (PITHAMPUR), INDIA
18. MUKAT TANKS & VESSELS LTD., INDIA
19. PRATIBHA INDUSTRIES LIMITED, INDIA
20. RATNAMANI METALS AND TUBES LTD., INDIA
21. SIDERCA S.A.I.C (ENQUIRY TOTENARIS), UAE
22. SUMITOMO METAL IND. LTD., INDIA
23. SURYA ROSHNI LTD., INDIA
24. SWASTIK PIPES LTD, INDIA
25. TATA STEEL UK LIMITED (FORMERLY C702)
26. TUBOS DE ACERO DE MEXICO SA (ENQ. TENARIS), UAE
27. TUBOS REUNIDOS SA SPAIN
28. UMRAN STEEL PIPE INC (TURKEY), TURKEY
29. VALCOVNY TRUB CHOMUTOV, CZECH REPUBLIC
30. VALLOUREC AND MANNESMANN TUBES, FRANCE
31. WELSPUN CORP LIMITED (DAHEJ), INDIA

**iii) PIPE/TUBE CS (SEAMLESS) TO ASTM STDS**

1. ARCELORMITTAL TUBULAR PRODUCTS ROMAN SA, ROMANIA
2. BHEL (TRICHY), INDIA
3. CHANGSHU SEAMLESS STEEL TUBE CO. LTD., CHINA
4. DALMINE SPA (ENQUIRY TO TENARIS, UAE
5. HEAVY METALS & TUBES LIMITED (MEHSANA), INDIA



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6. ISMT LTD. AHMEDNDR, INDIA
7. ISMT LTD. BARAMATI INDIA
8. JFE STEEL CORPORATION, UAE
9. JINDAL SDAW LTD (NASHIK WORKS) INDIA
10. KLT AUTOMOTIVE AND TUBULAR PRODUCTS LTD., INDIA
11. MAHALAXMI SEAMLESS LIMITED, INDIA
12. MAHARASHTRA SEAMLESS LTD, INDIA
13. PRODUCTS TUBULARES S.A.U, SPAIN
14. RATNADEEP METAL TUBES LTD., INDIA
15. STAINLESS TUBES PVT LTD., INDIA
16. SUMITOMO METAL IND. LTD., INDIA
17. TUBOS REUNIDOS SA SPAIN
18. VALCOVNY TRUB CHOMUTOV, CZECH REPUBLIC
19. VALLOUREC ANDMANNESMANN TUBES FRANCE
20. YANGZHOU CHENGDE STEEL PIPE CO. LTD DUBAI (UAE)

**iv) PIPE CARBON STEEL (WELDED) TO ASTM STDS**

1. EEW KOREA CO. LTD. (GERMANY), KOREA
2. EEW KOREA CO. LTD. (KOREA), KOREA
3. EISENBAU KRAMER GMBH, GERMANY
4. HYUNDAI RB CO. LTD., SOUTH KOREA
5. INOX TECH. SPA, ITALY
6. JINDAL SAW LTD (KOSI WORKS), INDIA
7. LALIT PIPES AND PIPES LTD., INDIA
8. MAN INDUSTRIES (I) LTD.(PITHAMPUR), INDIA
9. MAN INDUSTRIES (INDIA) LTD. ANJAR, INDIA
10. MUKAT TANKS & VESSELS LTD., INDIA
11. RATNAMANI METALS AND TUBES LTD., INDIA
12. SUMITOMO METAL INDIA LTD., INDIA





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### 13. TATA STEEL UK LIMITED

#### v) Valve

##### a) Globe Valves

- 1) M/s Weir BDK Valves (Aunit of Weir India Pvt. Ltd.)
- 2) M/s Datre Corpn (Calcutta)
- 3) M/s KSB Pumps Ltd., Coimbatore, India
- 4) M/s L&T Audco
- 5) M/s Neco Schuber & Salzer Ltd. (New Delhi)
- 6) M/s Niton Valve India Pvt. Ltd., India
- 7) M/s Ornate Valves (Mumbai)
- 8) M/s Panchavati Valves & Flages (P) Ltd., India
- 9) AV Valves Ltd., India
- 10) BHEL (Trichy), India
- 11) Econo Valves Pvt Ltd, India
- 12) Fouress Engg (I) Ltd (Aurangabad), India
- 13) Leader Valves Ltd, India
- 14) Oswal Industries Ltd, India
- 15) Petrochemical Engineering Enterprises, India (Fouress Group)
- 16) Sakhi Engineers Pvt Ltd., India
- 17) Shalimar Valves Pvt Ltd., India
- 18) Steel Strong Valves India Pvt Ltd, India
- 19) Petro Valves Pvt. Limited, Ahmedabad
- 20) Fluid Line Valves Co. (P) Ltd., India
- 21) MICON Engineers (Hubli) (P) Ltd., India
- 22) Nilon Valves Pvt. Ltd., India
- 23) KBL, India

##### b) Check Valves

1. M/s Advance Valves Pvt. Ltd., Noida



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2. M/s Aksons & Mechanical Enterprises, Mumbai
3. M/s Larsen & Toubro Limited (M/s Audco India Limited, Chennai)
4. M/s AV Valves Ltd., India
5. M/s Weir BDK Valves (A unit of Weir India Pvt. Ltd.)
6. M/s BHEL, Trichy
7. M/s Datre Coroportion Limited, Calcutta
8. M/s Leader Valves Ltd., Jalandhar
9. M/s Neco schubert &Salzer Ltd., New Delhi
10. M/s Niton Valves Industries (P) Ltd., Mumbai
11. M/s Precision Engg.Co., Mumbai
12. Econo Valves Pvt Ltd, India
13. Fouress Engg (I) Ltd (Aurangabad)
14. KSB Pumps Ltd (Coimbatore), India
15. NSSL Ltd. (Neco Schubert & SalzerLtd)
16. Oswal Industries Ltd, India
17. Panchvati Valves & Flanges Pvt Ltd, India
18. Petrochemical Engineering Enterprises, India (Fouress Group)
19. Sakhi Engineers Pvt Ltd
20. Shalimar Valves Pvt Ltd
21. Steel Strong Valves India Pvt Ltd, India
22. Fluid Line Valves Co. (P) Ltd., India
22. MICON Engineers (Hubli) (P) Ltd., India
23. Nilon Valves Pvt. Ltd., India
24. KBL, India

**c) Plug Valves**

1. M/s Breda Energia Sesto Industria Spa, Italy
2. M/s Fisher Sanmar Ltd., Chennai
3. M/s Larsen & Toubro Ltd., (Audco) New Delhi



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4. M/s Nordstrom Valves, USA
5. M/s Serck Audco Valves, UK
6. M/s Sumitomo Corporation India Pvt. Ltd., New Delhi
7. M/s Z Corporation, Korea
8. M/s Hawa Valves (India) Pvt. Ltd., Mumbai
9. M/s Steel Strong Valves India Pvt. Ltd., Navi Mumbai
10. M/s Econo Valves Pvt. Ltd., India (WSSL Ltd. Group Co.)
11. M/s Flow-Serve PTE (Mfr. SERCK), India
12. M/s Galli Cassina SPA, Italy
13. Nilon Valves Pvt. Ltd., India
14. KBL, India

**d) Ball Valves**

1. M/s Hawa Valves (India) Pvt. Ltd, Navi Mumbai
2. M/s Larsen & Toubro (Audco), India
3. M/s Oswal Industries Ltd., India
4. M/s Virgo Engineers Ltd., Delhi
5. M/s Boteli Valve Group Co. Ltd., China
6. M/s Cameron Italy s.r.l., Italy
7. M/s Dafram S.P.A., Italy
8. M/s Fangyuan Valve Group Co. Ltd., China
9. M/s Franz Schuck GmbH, Germany
10. Kita Mura Valve Manufacturing Co.Ltd., India
11. Petrol Valve S.R. Italy
12. Pipiviesse S.P.A. Italy
13. Tormene Gas Technology S.P.A. Valvetalia Group, Italy
14. Valbeot S.R.L. Italy
15. KMC Corporation, South Korea
16. MSA a.s. Czeek Republic



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17. OMS Aleri, Italy
18. PCC Valves s.r.l. Italy
19. Perar s.p.a. (Engineering. To TRP srl), Italy
20. Italy s.r.l., Italy
21. MIR Valves, Malaysia
22. Nilon Valves Pvt. Ltd., India
23. KBL, India

**e) Gate Valves**

1. M/s Associated Toolings (India) Pvt. Ltd,
2. M/s BDK Engineering Industries Ltd.,
3. M/s BHEL (Trichy)
4. M/s KSB Pumps Ltd (Coimbatore)
5. M/s Larsen & Toubro Ltd.
6. M/s Leader Valves Ltd.
7. M/s M.H. Valves Pvt. Ltd.
8. M/s Niton Valve Industries Pvt Ltd.
9. M/s Oswal Industries Ltd.,
10. M/s Petrochemical Engineering Enterprises
11. M/s Steel Strong Valves India Pvt. Ltd.
12. Nilon Valves Pvt. Ltd., India
13. KBL, India

**vi) Flanges**

1. M/s Aditya Forge Ltd., Vadodara
2. M/s Amforge Industries Ltd., Mumbai
3. M/s CD Engineering Co., Ghaziabad
4. M/s Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
5. M/s Echjay Industries Ltd., Rajkot
6. M/s Forge & Forge Pvt. Ltd., Rajkot
7. M/s Golden Iron & Steel Works, New Delhi



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8. M/s JK Forgings, New Delhi
9. M/s Metal Forgings Pvt. Ltd., Mumbai
10. M/s Perfect Marketings Pvt. Ltd., New Delhi
11. M/s Sky Forge, Faridabad
12. M/s S&G, Faridabad
13. Chaudhry Hammer Works Ltd, India
14. JAV Forgings (P) Ltd, India
15. Kunj Forgings Pvt Ltd, India
16. MS Fittings Mgf. Co. Pvt. Ltd.
17. R.N. Gupta & Co. Ltd, India
18. R.P. Engineering Pvt Ltd, India
19. Sanghvi Forgings & Engineering Ltd
20. Shri Ganesh Forgings Ltd., India
21. Uma Shankar Khandelwal & Co., India
22. Sawan Engineers, Baroda
23. Stewarts & Lloyds of India Ltd., Kolkata
24. Engineering Services Enterprises
25. Abasi Engineersing Works, India
26. Anandmayee Forgings Pvt Ltd, India
27. CD Industries., India
28. Fivebros Forgings Vot Ltd., India
29. Good Luck Engineering Co., India
30. Korea Flange, South Korea
31. Lal Metal Forge Ltd, India
32. Melesi Officine
33. Amlrojje Melesi & C. srl. Italy
34. Nicola Galperti & Figlio S.P.A India
35. Paramount Forge, India
36. Pradeep Metal Limited, India
37. Punjab Steel Works (the), India



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38. R.D.Forge, India
39. Shah Industrial & Comml. Corporation, India
40. Ulma Forja S. Coop.
41. Vivial Forge Pvt. Ltd., Vadodara

#### **vii) Fittings**

1. M/s Commercial Supplying Agency, Mumbai
2. M/s Dee Development Engineers Ltd.
3. M/s Eby Industries, Mumbai
4. M/s Flash Forge Pvt. Ltd., Vishakhapatnam
5. M/s Gujarat Infra Pipes Pvt. Ltd., Vadodara
6. M/s M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
7. M/s Stewarts & Lloyds of India Ltd., Kolkata
8. M/s Teekay Tubes Pvt. Ltd., Mumbai
9. M/s Pipe Fit, Baroda
10. M/s Sky Forge, Faridabad
11. M/s S&G, Faridabad
12. M/s Sawan Engineers, Baroda
13. Eby Fasteners, India
14. R.N. Gupta & Co. Ltd, India
15. Exten Engg Pvt Ltd
16. Sivananda Pipe & Fittings Ltd
17. Chero Piping SPA, Italy
18. CSA Fittings, India
19. EBY Fasteners, India
20. Fittnox SRL, Italy
21. Keonsae High Pressure Co. Ltd., South Korea
22. Munro & Miller Fittings Ltd., U.K.
23. TK Corporation, South Korea





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24. Tube Turn (India) Pvt Ltd., India
25. Topaz Piping Industries, India
26. Technoforge SPA, Italy
27. P.K. Tubes & Fittings Pvt. Ltd., India
28. Vivial Forge Pvt. Ltd., Vadodara
29. Nilon Valves Pvt. Ltd., India

**viii) Gaskets**

1. IGP Engineers (P) Ltd., Madras
2. Madras Industrial Products, Madras
3. Dikson & Company, Bombay
4. Banco Products (P) Ltd., Vadodara
5. Goodrich Gaskets Pvt Ltd
6. Starflex Sealing India Pvt Ltd, India
7. Teekay Meta Flex Pvt Ltd
8. UNIKLINGER Ltd
9. HEM Engg. Corp.
10. Unique Industrial Packing Pvt. Ltd.

**ix) Fasteners**

1. Nireka Engg. Co. (P) Ltd., Calcutta
2. Precision Taps & Dies, Bombay
3. AEP Company, Vithal Udyoung Nagar
4. Fix Fit Fasteners, Calcutta
5. Precision Engg. Industries, Baroda
6. Echjay Forgings Pvt. Ltd., Bombay
7. Capital Industries, Bombay
8. Boltmaster India Pvt Ltd, India
9. Deepak Fasteners Limited, India
10. Fasteners & Allied Products Pvt Ltd, India



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11. Hardwin Fasteners Pvt Ltd, India
12. J.J. Industries, India
13. Multi Fasteners Pvt Ltd, India
14. Nexo Industries, India
15. Pacific Forging & Fasteners Pvt Ltd, India
16. Pioneer Nuts & Bolts Pvt Ltd, India
17. Precision Auto Engineers, India
18. President Engineering Works, India
19. Sandeep Engineering Works, India
20. Syndicate Engineering Industries, India
21. BEA SRL, Italy
22. Korea Parts & Fasteners (KPF), South Korea
23. Kundan Industries Ltd., India
24. Mega Engineering Pvt. Ltd., India
25. OME Metallurgica ERBESE S.R.L, Italy
26. Pankaj International, India
27. Udehra Fasters Ltd., India

**x) Welding Electrodes**

1. Lincoln, D&H, L&T, Ador

**xi) Fire Fighting Equipments**

**a) Fire Extinguishers**

1. Avon Services (Production & Agencies) Pvt. Ltd., Bombay
2. Kooverji Devshi & Co., Bombay
3. Zenith Fire Services, Bombay
4. Safex Fire Services, Bombay
5. Reliable (Fire Protection) India Ltd., Bombay
6. Brij Basi Hi
7. Tech Udyog



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8. Bharat Engg Works, India
9. Gunnebo India Ltd
10. Nitin Fire Protection Industries Ltd, India
11. Supremex Equipments, India
12. Vimal Fire Controls Pvt Ltd., India
13. Newage

**b) Fire Hydrants, Monitors, Deluge Valve, Nozzles**

1. Zenith
2. Minimax
3. Newage
4. HD Fire
5. Vijay Fire
6. Asco Strumech Pvt Ltd, India
7. Brij Basi Hi
8. tech Udyog
9. Gunnebo India Ltd
10. Nitin Fire Protection Pvt Ltd
11. Shah Bhogilal Jethamal & Brothers
12. Venus Pumps & Engineering Works
13. Technico

**c) RRL Hose**

1. Jayshree
2. Newage

**d) Hoses**

1. Ashit Sales Corporation, Bombay
2. Royal India Corporation, Bombay
3. Gayatri Industrial Corporation
4. Simplex Rubber Products Ltd., Ahmedabad



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5. Zaverchand Marketing Pvt. Ltd., Baroda

6. Presidency Rubber Mill, Calcutta

7. The Cosmopolite, Calcutta

8. Simplex Rubber Products, Thane

9. Newage

**e) Hose Delivery**

1. Chhatarya Rubber & Chemical Industries,

2. Nitin Fire Protection Industries Ltd, India

**f) Fire Hose Accessories**

1. Asco Strumech Pvt Ltd

2. Brij Basi Hi-tech Udyog

3. Gunnebo India Ltd

4. Shah Bhogilal Jethamal & Brothers

5. Vimal Fire Controls Pvt Ltd., India

**xii) Cold Applied Tapes**

1. Denso GmBH

2. Polyken (Berry Plastics Corporation)

**xiii) High Build Epoxy Coating**

1. Berry Plastics – Powercrete

2. Specialty Polymer Canada

3. Denso Protal, Canada

**xiv) NDT AGENCY**

1. NDT Services, Ahmedabad

2. GEECY Industrial Services Pvt. Ltd., Mumbai

3. Corrosion Control Services, Mumbai

4. Perfect Metal Testing & Inspection Agency, Calcutta

5. Inter Ocean Shipping Co., New Delhi

6. RTD, Mumbai



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7. Sievert, Mumbai
8. X-Tech, Vizag
9. Other Reputed & certified agencies.

**xv) Temperature Safety Valve (TSV)**

1. Emerson Process ( Erstwhile M/s Fisher Rosemount )
2. Instrumentation Ltd., Palghat
3. Keystone Valves, Baroda
4. Mekaster Valves & Engineering Services (P) Ltd., Vadodara (formally M/s Sevim Valves India (P) Ltd., New Delhi)
5. Tyco Sanmar, New Delhi
6. Parcol SPA
7. Tai Milano SPA
8. Nuopignone, Italy
9. Sarasin, France
10. Fainger Leser, Mumbai

**xvi) T TYPE STRAINER**

- 1) M/s Gujarat Otofilt, Ahmedabad
- 2) M/s Genius Filters & Systems (P) Ltd., Vishakapatnam
- 3) M/s Delta Filters & Separators (P) Ltd., Navi Mumbai
- 4) M/s Multitex Filters (P) Ltd., New Delhi
- 5) M/s Bhagwati Filters (P) Ltd., Ahmedabad
- 6) M/s Patel Filters Ltd., Ahmedabad
- 7) M/s Industrial Filtration Services
- 8) M/s Forum Filters & fabricators, Ankleshwar
- 9) M/s Filtration & Separation, Kalpavruksh
- 10) M/s Grand Prix Fab. (P) Ltd., New Delhi

**xvii) Y TYPE STRAINER**

- 1) M/s Gujarat Otofilt, Ahmedabad



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- 2) M/s Grand Prix Fab. (P) Ltd., New Delhi
- 3) M/s Ravi Techno
- 4) M/s Technico

**xviii) Inline Blender Proportioner**

- 1) M/s HD Fire
- 2) M/s Chemguard

Note: In case vendor list of a particular item is not available, the contractor shall specifically seek Consultant/DPA approval on the proposed list of vendors before procurement of the respective item.

**GUIDE LIST OF MAKES OF MATERIAL**

**Fire Hydrant System**

Sr. No	Product Description	Make
1.	ERW MS black pipe	Tisco/ Jindal/ Surya / Ajanta/ Gujarat Steel
2.	MS flanges	Aditya forge/ forge & forge/ metal forging/ CD Engg./ Amforge Industries/ JK forge 3
3.	Water Monitor	Newage/HD/ Minimax/ Vijay Fire / Zenith
4.	Double Headed hydrant Valve	Newage/HD/ Minimax/ Vijay Fire / Zenith
5.	Rubberized fabric lined hose	New age/ Jayshree
6.	Gunmetal branch pipe	Newage/HD/ Minimax/ Vijay Fire / Zenith
7.	Gunmetal nozzle	Newage/HD/ Minimax/ Vijay Fire / Zenith
8.	Fire men's axe	Newage/HD/ Minimax/ Vijay Fire / Zenith
9.	Fire Brigade inlet (2way & 4- way)	Newage/HD/ Minimax/ Vijay Fire / Zenith
10.	screwed single acting air valve	Flowchem/KSB/leader





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11.	Cast steel sluice valve	flowchem/KSB/Audco/Kalpana
12.	Fire Hose cabinet	Newage/HD/ Minimax/ Vijay Fire / Zenith 13
13.	Pressure Gauge	AN instrument/ General Inst
14.	Pressure Switch	Indfoss / Switzer or equivalent

### Fire water Spray System (HVWS & MVWS)

Sr. No	Product Description	Make
1.	GI Pipe	Tisco/ Jindal/ Surya Prakash/ Ajanta/ Gujarat Steel
2.	MVWS Nozzle	HD/ Kidde/ Technico or equivalent
3.	Quartzoid Bulb Detector	HD/ wiking/ spray safe or UL listed
4.	Deluge Valve	HD/ Kidde / Technico
5.	Gate valve	flowchem/venus/KSB/Audco/Kalpana
6.	y' type Strainer	Gujarat Otofilt/ Grandprix / Ravi Techno/ Technico
7.	Pressure switch	Indfoss/ Switzer or equivalent
8.	Cable	INCAB/ Universal cable/ Asian cable/ KEI or as per tender make

#### Notes:

1) In the event of any ambiguity or conflict between the Preferred Makes listed above, the order of precedence shall be the order in which the Contract Documents are listed below (i.e. SCC will prevail over GCC and TS will prevail over GTS):

- Special Conditions of Contract
- General Conditions of Contract
- Technical Specifications
- General Technical Specifications

2) For procuring bought out items from vendors other than those listed above or for any other item(s) for which the vendor list is not provided, Tenderers can supply those item(s) from



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vendors/ suppliers who have earlier supplied same item(s), the same may be acceptable subject to the following: -

- a) The vendor/ supplier of bought out item(s) is a manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing/ supply range- to be certified by the manufacturer on its letter head.
  - b) The vendor / supplier should not be in the Holiday list of DPA / Consultant / other PSU- to be certified by the manufacturer on its letter head..
  - c) Should have supplied at least one single random length (i.e. 5.5 meters to 6.5 meters) for item assorted pipes / tubes and for other items, which are to be supplied in quantity on number-basis (other than assorted pipes / tubes) minimum 01 (One) number of same or higher in terms of size and rating as required for intended services-PO copy(s) to attach.
- 3) The details of vendors indicated in this list are based on the information available with Consultant, Contractor shall verify capabilities of each vendor for producing the required quantity. PMC does not guarantee any responsibility on the performance of the vendor. It is the contractor's responsibility to verify the correct status of vendor and quality control of each parties and also to expedite the material in time.
- 4) For any new agencies/ vendors, bidders can submit the PTR of the agencies/ vendors who have earlier successfully completed the works for the intended services in earlier similar type of projects.

The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their offer, however in case of successful bidder, these documents shall require to be submitted by them for approval to DPA / Consultant.



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### THIRD PARTY INSPECTION AGENCY

Contractor shall appoint anyone of the following TPIA for inspection purpose for whole project till completion as directed by EIC. Contractor has to propose minimum 4 nos. of below listed agencies to be approved by DPA / Employer:

- a) Lloyd Register of Industrial Services
- b) Technische Ulierwachungs Verein (TUV)
- c) Det Norske Veritas (DNV)
- d) AB-Vincotte
- e) Bureau Veritas
- f) SGS
- g) American Bureau Services
- h) Velosi Certification Services
- i) Certification Engineers International Limited(CEIL)
- j) Unique Engineering Services Pvt. Ltd.

The TPIA shall be appointed by the EPC Contractor for both “Brought out Items” & “Site activities” on approval of DPA/ Consultant. The cost towards the TIPA shall be borne by the contractor.

Apart from inspection by TPIA provided by the EPC contractor, inspection may also be performed by Employer / consultant. In addition to above, DPA may appoint TPIA if necessary.



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## 7A. CIVIL WORKS

### 7.00 CIVIL WORKS- PARTICULAR JOB SPECIFICATION



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## 7.01. General

This section of the specification covers entire civil engineering work for technological structures, pavements, pedestals, dismantling work. Foundation for all, structures and main equipment described elsewhere in this specification on a Turnkey basis for Design, Supply, Installation of Firefighting system and associated facilities including Operation & Maintenance thereof for a period of five years as per OISD-156 at Oil Jetty no. 08, Deendayal Port Authority- Kandla.

The scope of work is described in foregoing chapters, however a brief scope is given as under:

The bidder shall prepare a programme showing the schedule of preparation and submission of design calculation, design drawings, scheme drawings, Good for Construction drawings and Bar bending schedules including schedules for Quality checks. The programme shall include quantum of different activities of work planned month wise to complete the work.

All other miscellaneous civil engineering works for the proposed area required to complete the scope of work shall also be under the scope of bidder but not limited to the following.

- i) Provision of pedestals for the Firefighting pipeline and foam line and also other structural elements wherever required
- ii) Foundation for the Pumps and other accessories wherever required shall be suitably provided.
- iii) Civil works for Miscellaneous new Structures

**Special Note:** All the rehabilitation works shall be got done by authorised applicator of the approved products.

RCC exposed surface of all the pedestals, sleepers, newly built or renovated including the above ground or above Deck Level portion of the RCC works shall be painted with Anti -Carbonation paint as per specification.

All service facilities as discussed in respective chapters of this Technical Specification are to be provided. The major works are listed, however, bidders are to include all the works in order to complete the total work for smooth operation of finished facilities.

07.02 The proposed works are to be undertaken in an area indicated in the scope of work and situated within the proposed limits. Bidder is advised to visit the site and acquaint himself of the site condition and collect all such data as may be necessary for preparation of his offer. The scope shall cover complete civil engineering work for the proposed works within its battery limit, on turnkey basis including detail design of all facilities and structures including supply of all materials and execution. No extra claim whatsoever, on account of site condition/ non availability of data shall be entertained after acceptance of tender. As the work



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area falls under process area where transportation of hydrocarbon and chemicals takes place, special precautions shall be taken during construction.

### **07.03 Geo-Technical Investigation :**

The existing structures on soil have been designed as per soil conditions, however contractor has to conduct verification bore holes every 75 m (and also at every junction) to arrive at his safe bearing capacities before designing his structure at his own cost.

07.03.01 Geo-Technical Investigation shall entail the following:

Drilling holes of 150mm dia. In all type of soil by shell and auger method upto a max depth required or refusal strata (REFUSAL means when  $N > 100$  for 30 cms penetration) including recording of water table (if met with within the depth drilled) after completion of boring conducting the required laboratory test\* and other tests deemed required as per type of strata met at site.

\*Such as natural moisture content, liquid limit, plastic limit, shrink age limit, dry and bulk density, specific gravity, particle size distribution by sieve and hydrometer analysis, unconfined compression test, triaxial compression test (undrained), consolidation test, chemical test on soil samples and water samples, differential free swell test and direct shear test as per direction of Engineer – in – charge.

Allowable bearing pressure on the soil at various depths for different sizes of the foundations based on shear strengths and settlement characteristics of soil with supporting calculations. Factor of safety for calculating net safe bearing capacity shall be taken as per relevant codes and standard practices. Recommendation of liquefaction characteristics of the soil must be provided.

Comments on the chemical nature of soil and ground water with due regard to deleterious effects of the same on concrete and steel recommendations for protective measures.

### **07.03.02 Foundation Type.**

In general open, foundations shall be used support the structure loads. Foundations proposed to be built on the top of existing pavements, deck slabs, piers, jetty structure shall be made as per the proposals given along with the tender. The foundation shall be designed considering the soil report parameters and founded at least 1 m below the natural ground level. However pile foundation maybe used as per requirement of soil report what ever required. Contractor can also propose raft foundation combining different pedestals, if required.

### **07.04 Design parameters**

07.04.01 Design of structures, permissible stress, material, fabrication/erection, workmanship, inspection and testing and design criteria shall be in accordance with the latest edition relevant I. S. Codes and practices.

In, general, minimum loading shall be as per IS codes. However it shall be increased, if necessary, as per technological requirements.





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#### Wind Load (WL)

The design wind load shall be calculated as per provision of IS : 875 (part 3)

Seismic Load (SL) Design for seismic loads shall be done in accordance with IS : 1893.

07.04.02 All buildings and supporting structures including connections and foundations shall be designed to withstand the most adverse combination of loads. However the basic load combinations are as follows:

- a) 1.5 (DL+ LL)
- b) 1.2 (DL+LL+WL/SL)
- c) 1.5 (DL+WL/SL)
- d) 0.9 DL+/- 1.5 SL

07.04.03 Rigidity of the structures in both directions and stability of structure for worst combination of loadings shall be ensured. Other precautions like waterproofing, dust proofing, protection from heat, sound and corrosion etc, shall also be considered.

07.04.04 allowable bearing capacity of soil shall be as per approved Geo Technical report. For designing of structures/foundations, water table shall be considered.

07.04.05 Earth pressure for all underground structures shall be calculated using co-efficient of earth pressure at rest, co-efficient of active earth pressure, as applicable.

In general, relief for horizontal passive earth pressure shall not be considered. However in some specific cases, only for calculating resistance sliding like key portions provided under retaining walls, foundation with horizontal loads like thrust blocks/ similar foundations, passive earth pressure may be considered where compaction of soil (considered for passive relief) is fully ensured and in any case when passive relief is considered, passive resistance of top 500 mm from finished ground level shall be ignored.

07.04.06 Bidder to submit good for construction drawings with design calculations and load data, in editable soft copies and hard copies along with soft copies of of STAAD analysis and EXCEL sheet for approval. In case software is used for analysis and design of structures, latest version of STAAD pro shall be used.

07.04.07 In specific cases where any established theory is not available in IS: codes for supporting the design calculations, reference of established literature/ books may be used in consultation with DPT/CLIENT before submitting it as supporting document and in those cases the photocopy of the relevant pages of reference literature/ book shall be enclosed by the contractor along with design documents.

07.04.08 In design of various structures, seismic and wind forces of the proposed area shall be considered in design as required.



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07.04.11 All design and drawing documents related to RCC structures/ brick masonry (other than steel structures) shall be submitted for approval separately from design and drawing documents related to steel structures.

07.04.12 For design purpose, ground water shall be considered upto finished ground level. All foundations shall be checked against overturning and sliding (wherever necessary) for all worst load combinations and considering ground water table and submerged weight of soil and submerged weight of RCC below finished ground level.

07.04.13 Minimum dimensions of RCC pedestals / columns / members supporting the steel superstructure columns / members shall be so decided that minimum criteria mentioned as follows are satisfied.

07.04.14 As general guidelines, minimum projections of outer edge of RCC pedestal / column / members shall not be less than the dimensions indicated as follows

- a) 75 mm from the outer edge of steel base plate.
- b) 100 mm from outermost face / edge of steel embedded members, anchor plates etc.
- c) 5 times the diameter of outermost largest diameter of embedded bolts from centre line of the outer most bolts.
- d) 150 mm from the outer edge of pockets if any.

However in cases if there is space / functional constraints / limitation mentioned by the supplier of equipment etc. then the above dimensions may be adjusted with proper precautions.

#### **07.05 Reinforced concrete structures and plain concrete**

07.05.01 Reinforcement concrete structures including superstructures and underground construction shall be designed and constructed in accordance with I. S. Codes. However concrete of following minimum grades shall be used:

Mud mat (PCC) M 20C M20 B

For flooring (PCC) M20C

For flooring / paving/pedestals/sleepers etc.(RCC) M 35C

For Encasing of Structural Supports M25C

R.C.C. (except water/ liquid retaining structures) M35C

RCC in water/ liquid retaining structures M35C

Other Minimum requirements shall be as per requirements of IS 456 : 2000 Conforming to "very severe" Environmental exposure conditions in Table 3.

07.05.02 The mix-design shall be adopted for proper strength, workability and service requirement.



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07.05.03 Additives and retarding agents for concreting, floor hardening additives, acid resisting and integral waterproofing compounds shall be added to the concrete depending upon requirements.

07.05.04 Wherever vertical earth retaining is necessary as per functional/ service requirement or for space constraints, only RCC retaining walls shall be considered.

07.05.05 For design of retaining walls, all loads as per cl 5.1.1, IS: 14458(part 2) shall be considered.

For ground water pressure, water table shall be considered up to formation level in earth retaining side unless effective water pressure relief system is provided. In case even effective pressure relief system is provided consisting of weep holes and graded filter material as specified in IS: 14458 (refer cl 6.5), at least 30% water pressure shall always be considered as per IS:14458 (part 2) cl 5.1 factor of safety against overturning and against sliding shall be considered as per IS: 14458 (part 2) & IS: 1904.

In case of checking against overturning and sliding, submerged unit weight of soil and RCC shall be considered.

In case of relief due to passive pressure of soil in toe side is considered only for sliding, then the height of soil in toe side shall be considered only upto minimum

500mm below FGL or depth of drain (if any) from FGL whichever is deeper in toe side. However for checking of base pressure, for design of RCC members like stem wall, base slab etc and in checking against overturning, no passive relief in toe side shall be considered. Wherever necessary, for taking care against sliding, RCC shear key under base raft or piling (if unmanageable by shear key) shall be considered.

For strength design of stem/ vertical wall, maximum horizontal pressure from soil in only one side of wall shall also be considered.

For calculation of base pressure and for checking against overturning and for strength design of base raft, horizontal active pressure (not passive) in toe side shall be considered along with all maximum possible loads in heel side.

Apart from the above, other worst load cases if any shall be considered for design purpose.

## **07.06 Storm Water Drainage and Sewerage System**

07.06.01 All rain water drainage, sanitary, fecal sewerage and plumbing system for all buildings and open areas shall be provided, if required.

07.07 All auxiliary and ancillary buildings housing toilets/ drinking water facilities shall be provided with water storage tanks at roof of the building separately for drinking and sanitary purposes.

07.08 The bidder shall indicate the estimated number of civil engineering drawings. [in equivalent A1 size].



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07.08.01 The successful bidder shall submit all basic engineering, schematic and subsequent detailed civil engineering good for construction drawings along with relevant load data and design calculations in editable soft copies and hard copies along with soft copies of STAAD analysis and EXCEL sheet for approval of Employer. All hard copies of design documents calculations etc shall be submitted in very clear, legible and presentable format and in bound pattern in requisite numbers. In case software is used for analysis and design of structures, latest version of STAAD Pro shall be used. In specific cases where any established theory is not available in IS: codes for supporting the design calculations, reference of established literature/books may be used in consultation with Employer before submitting it as supporting document and in those cases the photocopy of the relevant pages of reference literature/book shall be enclosed by the contractor along with design documents. The successful bidder shall submit all as built drawings after completion of works.

#### **07.09 General instructions**

##### **07.09.01 Local conditions**

The bidder, before submitting his tender, shall visit the site and ascertain the local conditions, labor rules, availability of construction materials, traffic restrictions, all obstructions in the area and also ascertain all site conditions including the sub-soil conditions and shall allow for any extras likely to be incurred due to all such conditions in his quoted prices. After the award of work no additional claims will be entertained on these accounts under any circumstances, what so ever, from the bidder.

##### **07.09.02 Setting out and leveling**

The bidder shall set out and level the work and will be responsible for the accuracy of the same. He is to provide all instruments and proper qualified staff with labour for getting his work checked by Engineer, if so desired by the Engineer. Such checking, if any, shall not however, relieve the bidder in any way, of his responsibility for correct setting out.

##### **07.10 Safety**

The bidder shall take adequate precautions to ensure complete safety and preventions of accidents at site and shall be responsible for the same. Relevant chapter for safety requirements for construction works as indicated in General Technical Specification of civil works shall be followed.

##### **07.11 Keeping work free from water**

The bidder shall provide and maintain at his own cost, pumps and other equipments to keep the works free from water and continued to do so until the handing over of the works Rubbish.

The bidder shall keep the site clear on a continuous basis of all rubbish etc. which may arise out of the work executed by him and dispose them suitably in allotted areas.

##### **07.12 Bench Marks, Reference Pillars etc.**



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The bidder shall provide and also protect all benchmark, and reference pillars /lines including ground water gauges from damage or movement during working. In case of any damage the bidder shall have to restore the same to its original condition at his own cost.

### **07.13 Standards**

Unless otherwise mentioned in the specifications, all applicable codes /standards as published by the Bureau of Indian Standards on the date of award of contract shall govern the work in respect of design, workmanship, quality and properties of materials, method of testing and other pertinent features. In case of variance between this specifications and IS Codes/ Standards, the provisions of this specification shall prevail up to the extent of such variance.

### **07.14 Drawings**

Work shall be carried out as per drawings prepared by the Contractor and approved by the DPT / Client. The drawings shall include General Arrangement, Good for construction, drawings of structures, Reinforcement details, shuttering, bolt plans insert plans and details, conduit plans, etc required for the execution of the job. Also, the design calculations shall be submitted in the requisite number of copies for the approval by the DPT/Client.

All drawings shall be submitted in standard A1, A0, or A2 size and all details in drawings shall be submitted in standard scale so that all details are legible and presentable.

07.15 This specification shall be read in conjunction with the general conditions of contract and other project requirement provided in the other volumes containing special conditions of contract, instruction to bidders, special instructions to bidders etc

Specification for civil works comprises, besides this section, one volume of General Technical Specification for civil engineering works. This volume shall also form part of this section and the refore shall be read in conjunction with this section. However, in case of any difference between any clause set out in this Technical Specification and that in relevant clauses of General Technical Specification, former shall prevail.



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## List of Civil Engineering Drawings and Documents for Approval/Information

### Group – 1: For Approval

S.No	Description
1.	Drawing numbering system
2.	List of drawings, withdrawing Nos. and title
3.	Basic design criteria and loading for all buildings, structures and foundations.
4.	Site plan/layout drawing with battery limit in 1:500 scale
5.	Design calculations in editable soft copies and hard copies along with soft copies of STAAD analysis/Excel and load data for buildings, foundations for equipment and structures, auxiliary etc. (design calculations shall be submitted along with or before submission of G.A. and RCC drawings). In case software is used for analysis and design of structures, latest version of STAADPro shall be used. All hard copies of design documents, calculations etc shall be submitted in very clear, legible and resenable format and in bound pattern in requisite numbers. In specific cases where any established theory is not available in IS: codes for supporting the design calculations, reference of established literature/ books may be used in consultation with DPT/ CLIENT before submitting it as supporting document and in those cases the photocopy of the relevant pages of reference literature/ book shall be enclosed by the contractor along with design documents.
6.	General arrangement, plan and sectional drawings with all dimensions and details for foundation of equipment and structures, auxiliary facilities etc.

Brief scope of Work-





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Sl.No	Description of Item
1	Providing and laying in position machine batched and machine mixed design mix M-35 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but including the cost of centering, shuttering, finishing and, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability, but excluding cost of reinforcement as per direction of Engineer-in-charge.“(Note :- Cement content considered in this item is @ 400 kg/cum.“Excess/ less cement used as per design mix is payable/recoverable separately).
	All works above plinth level upto floor V level
2	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level for pedestals for pipe support
	Thermo-Mechanically Treated bars of grade Fe-500 D or more of various diameters
3	Providing and laying non-shrink cementitious Grout of compressive strength M-40 under the Base plate, column holes with thickness of grout 25mm complete in all respects as per spec. and direction of EIC.
4	Providing & Applying a single coat of approved make Epoxy Resin based bonding agent (such as Concessive 1414 of BASF/SIKADUR 32 LP of SIKA/ShaliBond Concrete of STP/Epoxy Bonding Agent of Dr Fixit/Nitobond SBR of Fosroc or equivalent approved product) over concrete surface as per manufacturer's specification inclusive of Manpower, Material and Equipment all complete.
5	Providing and applying single component, high build high performance, acrylic resin based coating, crack bridging elastomeric protective coating for long term protection of concrete from aggressive atmospheric gases such as, carbon dioxide, sulphur dioxide and chloride ions. Thickness shall be DFT of 300 Microns having elongation of 300%, water vapor transmission shall be greater than 70g/Sqmt/day, tensile strength >1 @ 300 micron, crack bridging >2mm Product shall be Masterprotect 300 of BASF or equivalent. The product shall offer resistance to CO2, diffusion, and chloride ion penetrability. Protective coating shall be applied after application of acrylic primer followed by protective coating at desired color at 0.9kg per sqmt using airless spray in one coat or using roller or brush application using airless spray. Surface Preparation The cleaning and preparation of the substrate must be carried out thoroughly to leave a sound base for the application. Any oil, grease, rust, paint, etc. present on the surface must be removed mechanically which otherwise may impair adhesion. Cracks shall be repaired and expansion joints shall be treated. Primer Application An acrylic resin based primer cum curing compound to be applied before application of Coating on all the surface. Rate shall be all inclusive including all materials and labour, and application shall be as per manufacturer's specification and as per direction of Engineer In Charge.



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## 7B. STRUCTURAL WORKS



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### Particular Job specification for Steel Structural Works for Fire Fighting Works

The scope of work shall be read in totality with TS however a brief scope is given as under:

1. The contractor shall carry out detail engineering including preparation of design calculations, design drawings, fabrication drawings, dismantling & removal of steel structures, scheme drawings for rectification, modification & strengthening of existing structures, scheme for temporary supports, erection procedure, etc and getting approval from consultant, procurement of raw steel, fabrication & supply, erection, alignment painting, painting on existing structures, painting of rectified & refurbished structures, procurement and supply of sheeting etc, finishing and handing over of all steel structural work on a turnkey basis for the projects / works including all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of the terminal, all in strict accordance with the specifications, including revisions and amendments thereto as may be required during the execution of work.
2. The contractor shall prepare a programme showing the schedule of preparation and submission of design calculation, design drawings, scheme drawings for temporary supports, fabrication drawings, erection procedure, procurement of raw steel, supply of fabricated steel structures, inspection, erection alignment, painting dismantling & removing of existing steel structures for particular unit / location. The erection dates shall be the dates for completion of all the followup work in addition to main erection keeping overall completion of project in view. The programme shall include quantum of different activities of work planned month wise to complete the work.
3. The tentative structural tender drawings are enclosed herein for detail and cross section of structure with section sizes (if mentioned) for columns, beams, bracing etc. these section sizes are minimum sections that shall be provided without any escalation in the quoted price and no extra payment shall be made for such changes in section sizes. For detail refer TS for Structural Steel Works.
4. Unit / location wise summary and brief of Scope for structural steel works as follows is not limited to the following. The scopes mentioned herein and in structural tender drawings are tentative and for planning purpose only and is aimed to give overall idea for bidder to quote for job, the same may vary during detail engineering.

S.No	Unit/Location	Works	Scope of Structural Steel
1.	Elevated Fire monitors	Design, supply and erection of New Steel Structures for the water tower cum foam fire monitors of suitable height (approx.) shall be provided for support of fire Monitors with 3 level grated platforms to have approach by cat ladder as per design, painting & others requirement as per TS.  <b>New Fire monitor structures</b> required to be planned and designed as per provided during detail engineering.	



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2.	Pipe Supports for MVWS Network	New pipe supports structures for supporting MVWS network to be planned as per Fire network and structure to be designed and provided. All materials and works shall be completed as per specification and tender drawings.
3.	Miscellaneous Structures	Miscellaneous new structures that may include valve operating grated platforms, maintenance platforms, valve supports along with hand railing, pipe supports, pipe cross over, access stair case/ cat ladder or other structures as required technically or as per new pipeline layout shall be provided.

5. The description of structures and scope mentioned herein are tentative and final works shall be done as per technological requirement at site and at the time of detail engineering. Any observations or requirements in the structures apart from those as mentioned herein shall be completely under the scope of this tender and shall be executed as per the scope of this tender and shall be executed as per the direction of Consultant / Client. Contractor should visit the site and thoroughly understand the scope of work to be executed.

6. Collection of all site related data & conducting site investigations.

7. Preparation & submission of design calculation, design drawings, temporary supporting scheme drawings, fabrication drawings, erection procedures and obtaining DPT's approval on general arrangements and design of structures.

8. Submission of all approved design calculation, design drawings, fabrication drawings & scheme drawings in soft copy in 2 sets, after scanning the drawings bearing the approved stamp of Employer, in two new latest version Laptops and in hard copy in seven sets.

9. Supply, fabrication and erection of steel structures, including surface preparation and painting as per painting specification of T.S Transportation and delivery at site, unloading storage and handling at site, fabrication, site assembly and erection and structures at appropriate locations, connection, by permanent G.I bolting (8.8 grade) only (no welding at site is allowed), including alignment of all structures true to line, level, plumb and dimension.

10. Preparation of rectification & Strengthening schemes of part or portion of Existing Structures. Such schemes shall be submitted along with complete details scheme drawings and design calculations, and structures to be rectified & strengthened, erected in position and painted as per painting scheme in TS.

11. All site connections for erection and handling purposes shall be of bolted type and shall include supply of fasteners like bolts, nuts, washers etc.

12. Supply of consumables like electrodes for welding, gases for gas cutting etc, only at fabrication yard, at site only manual cutting shall be allowed.

13. Supply of plant & machinery, tools, tackles, instruments for fabrication and erection.



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14. Providing facilities for testing of materials and conducting NDT.
15. Providing facilities for transport and handling.
16. Deploying requisite skilled and unskilled manpower.
17. Making arrangements for all services like approach to site, electricity, water, etc. on own.
18. Fabrication of structures, their transport and proper storing at site.
19. Erection of structures at all height and levels, etc.
20. Application of paints at shop after fabrication and at site after erection as per painting specification in TS.
21. Providing all reasonable facilities for inspection by Consultant / Client.
22. Conducting NDT as stipulated by the Consultant / Client and making test results available to Consultant / Client for evaluation.
23. Compliance with primary acceptance tests / inspection, liquidation of defects; compliance with final acceptance tests / inspection, liquidation of defects.
24. Carrying out field-engineering decisions as directed and desired by Consultant / Client.
25. Preparation of a programme showing the schedule of preparation and submission of fabrication drawings, procurement of raw steel, supply of fabricated steel structures, inspection, erection alignment, painting for each area / unit. The erection dates shall be the dates for completion of all the follow-up work in addition to main erection keeping overall completion of project in view. The programme shall include quantum of different activities of work planned month wise to complete the work.
26. Any other work deemed incidental for the completion of the overall work but not included in the above detailed scope.
27. Following is the table for description of items that shall be executed in this work:

Sl.No	Description of Item
1	<b>Design, Supply, fabrication and erection of steel structures : (New Structures)</b>
	Design, detail engineering, preparation of design drawings, fabrication drawings and getting approval of all design calculations & drawings from consultant/client including supply fabrication of steel structures such as all types of fire monitors, pipes supports, approach & platform for valve operation, crossover structures, staircase, cat latter or any other structures required for completion the works, etc including surface preparation by sand blasting confirming to Swedish Standard SA 2½ for painting, supply and application of 1st coat of Inorganic Zinc Silicate 75 microns DFT with volume solid of 65% , 2nd coat of Intermediate of Cycloaliphatic Amine adduct epoxy phenolic of 150 microns DFT with volume solid of 80% , 3rd coat Finishing paint of Acrylic Polyurethane 40 microns DFT and 4th coat finishing Paint of Acrylic Polyurethane 40 microns DFT with volume solid 57% (Total DFT=305 microns



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	minimum) of approved colour, including transportation and delivery at site, unloading, storage and handling at site, site assembly and finally erection of structures at appropriate locations, fixing by permanent G.I bolting (8.8 Grade) only, including alignment of all structures true to line, level, plumb and dimension. All works shall be completed as per Specification, scope and description of works, drawings and as per direction of the Engineer-In-Charge. (The cost & weight of bolts permanent and service, washers, electrodes, putty, gases, shims, packs, cost of straightening the raw materials, cutting of flats from plates and providing splices, paints, tools, plants, testing of materials, Inspection, etc. and all other consumables as required for completion the work shall be deemed to be included in the quoted rates).



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## 7C. ELECTRICAL WORKS





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## 1.1 METEOROLOGICAL DATA OF SITE

The fire protection systems shall be designed taking into account the meteorological data prevailing at the project site.

## 1.2 INTENT OF SPECIFICATION

The intent of the specification is to cover the engineering, manufacture / fabrication, procurement, assembly, testing, packing, forwarding to site, unloading at site, receipt, storing, commissioning and guaranteed performance of the following and as outlined in various chapters of the technical specification:

## 2.0 INSTRUCTIONS TO TENDERERS

2.1 This specification forms a part of the tender documents and shall be read in conjunction with the same.

2.2 The Tenderer shall arrange to transport and deliver at site, all equipment and accessories to be supplied by him.

2.3 The Tenderer shall submit the following drawings, curves and information along with the offer.

- i. Outline and general arrangement drawing of the Foam pump sets including prime mover.
- ii. Cross-sectional drawings of the Foam pump indicating list of parts and their material of construction.
- iii. Predicted performance characteristic curves of the pumps.
- iv. Manufacturer's description and illustrative literature for the pumps and prime movers.
- v. Recommended HP of prime movers.
- vi. A write-up on Foam pump performance test facilities.
- vii. Data called for in Data Sheet.
- viii. Technical specification of pump / engine offered.

## 3.0 General

3.1 The following drawings shall be submitted for approval after placement of order.

- i. Outline and general arrangement drawings incorporating all principal dimensions and also foundation design data for pump sets indicating static and dynamic loads.

3.2 All drawings, load data and other information to be furnished for Owner / Consultant's approval shall be progressively submitted in five (5) copies and the entire submission of documents completed within a month's time from the date of Owner's telex / letter of acceptance.



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The approval / comments, if any, of /on the drawings will be communicated by Owner/ Consultants within a week of receipt of the same. Within 15 days of approval of drawings/documents, the Tenderer shall supply 6 copies of approved drawings and documents and relevant catalogues, manuals etc., to Owner/Consultants along with one CD-ROM containing the drawings.

Approval of Tenderer drawings by Owner/Consultants shall not relieve him of any responsibility covered by the requirement of the Contract.

3.3 The Tenderer shall supply 6 sets of the following documents for approval before inspection prior to dispatch of equipment:

- i. Material test certificates.
- ii. Static and dynamic balancing test certificates on rotary parts.

3.4 The Tenderer shall supply operation and maintenance manuals along with the equipment. The manuals shall meet the following requirements:

i. The instruction manuals shall present the following categories of information in practical, complete and comprehensive manner prepared for use by operating and/or maintenance personnel.

- a) Instructions for initial installation.
- b) Instructions for operation, maintenance and repair.
- c) Recommended inspection points and periods of inspection.
- d) Ordering information for all replaceable parts.
- e) Lubrication chart.

ii. Drawings and other illustrations shall be included or copies of drawings shall be bound in the manual.

Test, adjustment and calibration information as appropriate shall be included and shall be identified to the specific equipment. Safety and warning notices and installation, maintenance and operating cautions shall be emphasized.

iii. A parts list shall be included showing part nomenclature, manufacturer's part number and /or other information necessary for accurate identification and ordering of replacement parts.

iv. If a standard manual is furnished covering more than the specific requirement purchased, the applicable model No., parts No. and other information for the specific equipment purchased shall be clearly identified.

v. The instruction manual shall include a list of all special tools and tackles furnished with complete drawings and instructions for use of such tools and tackles.

3.5 The system covers the basic scheme to be implemented to cater fire hazard in the entire area, as per OISD: 117, PNGRB, TAC / NFPA.



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#### 4.0 Brief Scope of Work-

### 1. ELECTRICAL WORKS

#### Note-

All the items of the electrical works are indicative and subject to change as per the design requirements and during execution on consultation and approval of DPT EIC. The EPC Contractor has to submit the design, drawings, detailed layout, item wise location map and relevant data as sought by DPT EIC for approval before execution at site.

SI.No	Description of Item
1	Supply & erection of outdoor Resin Casted dry type indoor transformers of 3000 kVA delta/star (DYN-11) of 3 Star Rating with appropriate foundation as directed along with NIPS with other fire safety provision considering the installation in the inflammable zone with provisions of volatile aerosols/ fumes as per the latest IS standards/norms applicable for Oil and Gas industries.  Note- The transformation ratio of the transformers shall be decided during the final execution by DPT EIC and may be 11/6.6kV or 11/ 3.3kV or 11/0.43 kV or as per the site requirement.- 2nos minimum
2	Supply, installation, testing & commissioning of 11 kV, 26.3 kA indoor draw out type VCB Panel, (As per standard specifications to receive input / output power from Four/Two pole structural. (1 no for incoming and 2 no for outgoing) with CT, PT, Volt, Ammeter, MFM and Energy Meters with 0.2S Class of accuracy.
3	6.6 kV, 50 kA Single front Draw out type indoor HT MCC Panel (As per Standard specifications) to receive input power from Distribution Transformer along with interlock between main incomer and grid incomer to APFC outgoing feeder and ACB panel shall be draw out type. 3 Nos. of DOL/Soft HT Starters. The panel shall be equipped with fire mitigation systems like Co2 flooding system or aerosol flooding system inside the panel to restrict the fire or fumes or smoke during the internal faults of the electrical panels that may cause overheating and result into fire or smoke risk.



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4	440 V, 50 KA Single front Draw out type indoor LT MCC Panel (As per Tender specifications) to receive input power from Distribution Transformer along with interlock between main incomer and grid incomer to APFC outgoing feeder & with LT Starters (Qty. as per site requirement with minimum 01 No. spare). The panel shall be equipped with fire mitigation systems like co2 flooding system or aerosol flooding system inside the panel to restrict the fire or fumes or smoke during the internal faults of the electrical panels that may cause overheating and result into fire or smoke risk.
5	Electrical HT Power
	Engineering, supply & erection, manufacture, shop testing, packing and forwarding, transportation, delivery at site of following Fire Survival HT Cable as per relevant IS Standard (Latest) and specification.
	Aluminium Conductor armoured HT cables of following sizes:
	3 x 185 mm <sup>2</sup> 6.6 KV(UE) Grade,XLPE
6	Electrical LT Power
	Supply , laying, testing and commissioning of cables underground in a trench, Al. clamping to Tray, steel concrete or brick surface including supply and installation of cable tags, supply and installation of required FLP/Non FLP glands as per requirement, terminations at both ends, supply including lugs, crimping of lugs etc.
	1.1kV grade LT Power and Control cables of following sizes:
	3.5Cx 120 mm <sup>2</sup> A2XFY
	3Cx 70 mm <sup>2</sup> A2XFY
	3.5Cx 50 mm <sup>2</sup> A2XFY
	3Cx 35 mm <sup>2</sup> A2XFY
7	Control Cable
	supply, Laying testing and commissioning of cables underground in a trench, Al. clamping to Tray, steel concrete or brick surface including supply and installation of required FLP/Non FLP glands as per requirement, terminations at both ends, supply including lugs, crimping of lugs etc.
	8Cx1.5 mm <sup>2</sup> 2XWY
	12Cx1.5 mm <sup>2</sup> 2XWY
8	Earthing and Lightning Protection



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	Supply, Testing, Commissioning of complete earthing and lightning protection system, earth electrodes/ pit, earth main ring, earthing of electrical equipments, instrument panels, field instruments, process equipments and pipes/ flanges including marking, jumpers all associated civil work with all material and labour as per specification & IS-3043 and drawings as approved.
8.1	Note- The shielding area/ coverage area of lightning rod has to be defined by the EPC contractor and if found necessary to cover the important area of the oil Jetty more lightning for rods may be installed after approval of the design and ascertaining shielding area in consultation and as directed by EIC.
8.2	Earth Pits- GI PIPE Electrode with 6 mm thick chequered plate cover/SFRC(Size 600 x 550mm) with 3.0 mts long GI Pipe
8.3	Pits- Copper plate Electrode with 6 mm thick chequered plate cover/SFRC(Size 600 x 550mm) with copper plate(600X 600X 3 mm
8.4	GI Strip (50X6) mm
8.5	GI Strip (25X6) mm
8.6	GI wire 8 SWG
8.7	Copper Strip (50X6) mm
8.8	lightning rod 25 mm dia. 1800 mm long including supply of all hardware bare copper rope labour, test box, isolator, etc. complete as per approved drawings, specifications and directions of Engineer-In-Charge.
8.9	Advanced Maintenance Free environment friendly Earthing system consisting of 1 no. of 3mtr length, 25 mm dia UL certified earth electrode made of high tensile low carbon steel circular rods, molecularly bonded copper on outer surface (minimum copper bonding thickness-250 microns) with GI/Cu terminals to connect incoming strips, Chamber etc including Ground enhancing chemical backfill compound for earthpit, it doesnot attack the soil or corrode the metal electrodes ,complete in all respect (Environment freindly backfill compound duly certified as per ANSI/NSF standard 60/Toxic content certificate as safe for use near potable ground water resources.
9	Supply, testing and commissioning of Flame Proof Welding Socket including structure,Civil Foundation and hardware etc complete in all respect.
9.1	Flame proof type 63 Amp. Welding socket-IP65 IIA/IIB-T3 category.
10	<b>Cable Tray</b>
10.1	Supply, testing and commissioning of following Hot Dip Galvanized Ladder/Perforated Type cable trays
10.2	Ladder type,made from 50mm height and 2.5 mm thick sheet steel & galvanized (86 microns) of following sizes.
	400 mm wide
12	<b>Erection Material</b>



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12.1	Fabrication and Erection of MS base frame support for switch gear and bracket for misc.electrical equipment,cable and cable tray support out of roled MS section,pipes,plates etc including welding, bolting,reveting, fiiting of anchor bolts and grouting work etc applying of one paint coat of anti rust primer two finish coats of approved synthetic enamel paints including bracking walls, floors etc for structure as required including supply of all GI hardware materials including all labour and materials complete as required and the direction of Engineer-in-charge
13	<b>Safety Items</b>
13.1	supply, erection and installation of the following including necessary clamp, bolts, rawl plugs etc. breaking and making good of walls
13.2	Shock hazard charts complete with frame and glass
13.3	First Aid Boxes
13.4	Caution boards including supply of necessary clamps, bolts and other hardware.
13.5	Single Line Diagram complete with frame and glass
14	<b>Insulating Mats</b>
14.1	Fixing and pasting of Insulating Mats (as per IS:15652 - 2006) of 1000mm width, for maintenance of electrical equipment in substation/MCC/VCB as required
14.2	6.6 KV grade of 2.5 mm thick
14.3	3.3 KV grade of 2.5 mm thick
15	SupplyTermination of electrical accessories including , cable tags, cable marker, nickle plated lugs, double compressed brass cable glands,brass adaptor/reducers/nipples, fixing of metallic anchor fasteners for supporting of cable trays ,ferrules, terminal strip,Paint,Conduit sealing compound,fire wool and misc. electrical switchgear including all labour and materials complete as required and as per directions of Engineer-In-Charge.
16	Suitable lighting provision iside the pump house

**Note-** The site should be made clear and devoid of any obstructions or unused items like unused cables, cable trays, poles, panels, unused switch gears or any other electrical components out of order/ use and the same shall be dismantled & shifted to DPT store yard as per the directions of DPT EIC.



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## 7D. INSTRUMENTATION WORKS





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## 1. INTRODUCTION

The Scope of Instrumentation work shall be Design, Engineering, Inspection, Supply, Installation, field testing/ calibration & commissioning of the complete instrumentation and control system covered in the tender document and required to make the system operational in accordance with other technical documents attached elsewhere.

## 2. INTENT OF SPECIFICATION

This specification is intended to define the requirements of Instrumentation Works at Deendayal Jetty, Kandla with a view to achieve safe, reliable, efficient and trouble-free operation of the system, safety of the plant, equipment, operating personnel and optimum utilization of erection materials.

The specification shall be read in conjunction with the design criteria, datasheets, system architecture drawing, P&ID, Terminal Layout & other drawings and documents enclosed with the tender document. All these documents shall form as a whole complete specification.

In the event of any conflict emerge out in / between this specification, data sheets, system architecture drawing, P&ID, Terminal Layout, other drawings and documents enclosed with the tender document, related standards, codes etc., the bidder should refer the matter to DPT for clarifications and only after obtaining the same, should proceed with the manufacture / supply / erection of the items in question.

All the equipment shall be new and supplied from the "LIST OF SUGGESTED MAKES" only

### 3.1 GENERAL

3.1.1 It is the responsibility of the bidder to assess the type and magnitude of work involved based on information furnished by DPT/Employer in this document and general field conditions. The Contractor shall be responsible for complete activities involving all subcontractors under him and also instrument sub-contractor's (if applicable) works under him for the complete instrument works, as part of his scope.

3.1.2 Scope of work shall be read in conjunction with the drawings, specifications and other documents forming a part of the Contract document. Wherever there is a contradiction between the above, material of better specification / qty. on higher side shall prevail.

3.1.3. In the control room, the contractor's scope shall include laying, tagging and identification of all cables connected between the field and the control room, dressing of the same inside the control room. It is the responsibility of the contractor for proper routing, dressing of cables, terminations in panels inside the control room and also for loop checking.

3.1.4. Contractor shall be responsible for co-ordination during installation, pre commissioning and commissioning with his Mechanical and other subcontractors for proper installation of instruments.

3.1.5. Contractor shall be responsible for all the works required for installation, field testing, calibration, pre-commissioning and commissioning of individual instruments as well as complete system.



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3.1.6. Contractor shall be responsible for coordination with the various vendors for all kind of works inside the control room i.e. cable laying, tray erection, if any, and for proper cable terminations and loop checking.

3.1.7. Drawings and Installation Standards enclosed with the tender are only for reference. Actual installation shall be carried out based on approved installation standards, Bill of material and approved vendor's drawings / documents and as per instructions of Engineer-in-Charge.

3.1.8. Instrument items such as tubes, tube fitting, valves & manifold, junction boxes, cables, cable glands, plugs, adapters, pipe and pipe fittings etc., as required for installation & hook-ups of instrument listed elsewhere shall be supplied from the attached list of Preferred Makes only. Contractor shall take prior approval of make and specification of such items before placement of order.

3.1.9. During trial run/startup/commissioning at all the locations, the contractor shall provide skilled personnel and supervision round the clock at contractor's cost. Any defect or changes of setting, recalibration, etc., if any during the above activity shall be rectified/done immediately to the satisfaction of engineer-in-charge or his representative. The number and category of the personnel shall be as decided by the engineer-in-charge.

3.1.10. Contractor's scope shall include making holes in the RCC for fixing up of supports for instrumentation items, trays etc. and cutting of RCC, if required, for laying of pipes etc and repairing the cut part to the original state as per the instruction of engineer-in-charge.

3.1.11. Contractor shall note that elbows (if required) shall be installed on the impulse line wherever required as per instructions of the Engineer-in-Charge even if it is not indicated in the installation standards.

3.1.12 The methodology of cable supports shall be as follows:-

a) Perforated/Angle/Ladder Trays (Contractor's supply) for all the cables from the individual instruments to the respective junction boxes.

b) Perforated/Angle/Ladder Trays (Contractor's supply) or Trenches (Prepared by contractor) as per the layout drawings (and any subsequent site adjustments as deemed necessary by the engineer-in-charge) from the junction boxes to the control room(s), the same supports/routes will have to be used for direct run cables from the individual instruments to the control room.

3.1.13 All Cable Trays shall have at least 20% spare free space.

3.1.14 All terminal blocks shall have at least 25% spare terminals (minimum being 4)

3.1.15 All types of cables shall have 25% spare cores. This is applicable to multicore/ multipair cables (6P/6C cables and above)

3.1.16 All types of junction boxes shall have 25% spare terminals and cable entries.

3.1.17 The field work shall be carried out under strict safety regulations and work permits as laid down by the Employer. The contractor shall take extreme care regarding safety and all safety



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gear like helmets; hand gloves, safety belts, spectacles etc. shall have to be provided by the contractor.

3.1.18 The single pvc sleeve type printed ferule shall be supplied. Ferruling for cables shall be done with tag no. of instruments for individual core. Cross ferruling shall be done for cable ferruling in field and panels as per instruction of the Engineer in charge.

3.1.19 All name plates, drawings, operating and maintenance instructions etc. shall be in English language. The dimensions, weights shall be in metric units.

3.1.20 All components shall be rated for continuous operation. The circuits also must be designed so as to prevent damage to other modules within the equipment or to other equipment under any conditions of operation or any condition of fault.

3.1.21 All power supply shall be through MCBs with suitable marking for the different ratings to enable easy identification and replacements.

3.1.22 The equipment shall also conform to the latest Indian Electricity Rules regarding safety, grounding and other essential provisions specified therein for installation and operation of the system.


3.1.23 The contractor shall have to assess the actual site conditions/requirements before placement of order for cable/trays as per the actual site condition. Contractor has to prepare a cable routing layout as per actual site requirements.

3.1.24 Allowable minimum bending radius of multipair / multicore cable shall be 6 times the outside diameter for unshielded cables and 8 times the outside diameter for shielded cables unless otherwise recommended by the supplier.

3.1.25 Location and flow direction of on-line instruments shall be checked by the contractor and to be rectified in case of any discrepancy as per the instruction of Engineer-In-Charge

3.1.26 The cable entry to the Control room shall be through MCT Blocks for all the control rooms, which shall be installed by the contractor. Contractor shall run all cables from field to Control Room. The cables shall run through Tray / Trench / road crossings from field to the control room as per Instrument Layout Drawings (to be furnished by Contractor during execution). The remote control system is envisaged to control all firefighting operations from the control desk located at the control room on the top floor of the pump house building.

- i) All the major equipment's shall be controlled from the remote control desk such as
  - a) Fire Water Pumps PUSH BUTTONS START / STOP
  - b) Foam Pumps PUSH BUTTONS START / STOP
  - c) Jockey Pumps PUSH BUTTONS START / STOP
  - d) Tower Monitors JOYSTICK – LEFT / RIGHT & UP/ DOWN
  - e) Base Monitors JOYSTICK – LEFT / RIGHT & UP/ DOWN
  - f) Water Curtain System Motorized Valves PUSH BUTTONS OPEN / CLOSE
  - g) All Motorized Valves PUSH BUTTONS OPEN / CLOSE

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- ii) The remote control panel shall also provisions for various indications / status of various equipment's such as :
- a) Fire Water Pumps LED ON/OFF
  - b) Foam Pumps LED ON/OFF
  - c) Jockey Pumps LED ON/Off
  - d) Tower Monitors LED RIGHT / LEFT & UP/DOWN
  - e) Base Monitors LED RIGHT / LEFT & UP/DOWN
  - f) Water Curtain System Motorised Valves LED OPEN / CLOSE
  - g) All Motorised Valves LED OPEN / CLOSE
  - h) Monitor Water System Pressure LED NORMAL
  - i) Hydrant Water System Pressure LED NORMAL
  - j) Monitor Position Indication 4-20 ma Display.
  - k) Monitor Line / Hydrant Line Pressure Indication 4-20 ma Display.
  - l) Foam Tank Level Indication 4-20ma Display.

The system shall consist of all the required panels, components, inter-connection cables, field sensors on all equipment / pipelines, junction boxes etc. to achieve the required functions.

3.1.27 Welding/NDT, Charpy V-notch, QA/QC requirement etc. shall be as per Piping Material Specification (PMS), DPT standards & specifications and other requirement attached / mentioned elsewhere in the tender document.

3.1.28 Welding shall be as per welding standard attached elsewhere in the tender document.

3.1.29 DPT / End User reserves the right to involve and satisfy himself at each and every stage of testing. They shall be free to request specific tests on equipment considered necessary by them, although not listed in the specification. The cost of performing all tests shall be borne by the Contractor.

3.1.30 Contractor to note that acceptance of any equipment or the exemption of inspection testing shall in no way absolve the Contractor of the responsibility for delivering the equipment, instruments meeting all the specified requirements.

3.1.31 It shall be Contractor's responsibility to modify and/or replace any item if the specified functions are not completely achieved satisfactorily during inspection and the same shall be borne by the Contractor without any price and delivery implications.

3.1.32 Items may be summarily rejected if found not manufactured as per approved documents. In that case, Contractor to again raise inspection call after complying the requirement and total cost incurred towards visit of DPT / End User for re-inspection shall be borne by the Contractor without any delivery implications.

3.1.33 Details of sub-vendor's contact person like Name, contact no., email id etc. shall be furnished after award of contract for information.



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3.1.34 Contractors & their sub-contractors shall work harmoniously with other agencies working at site to ensure smooth timely execution of the project.

3.1.35 At any stage of execution of contract, any material being not confirming to DPT / End User specification, the same shall be dealt as per the instructions of DPT / End User without any price and delivery implications.

3.1.36 Contractor may raise inspection call only after all the documents relevant to that item are cleared, the items have been manufactured accordingly and the items have been cleared after the internal inspection of the contractor. Internal inspection report of all the items must be generated and signed by the contractor and the inspecting personnel.

3.1.37 During detail engineering, all the datasheets / technical specifications are to be submitted by the Contractor duly verified, filled & signed stamped by relevant sub-vendor & Contractor.

3.1.38 Any change / modifications / items required during detailed engineering to meet the site requirements shall be done by the Contractor without any delivery & cost implications.

3.1.39 In the absence of any specifications covering any material, design of work (s) the same shall be performed / supplied / executed in accordance with Standard Engineering Practice.

3.1.40 Review/Approval of the Contractor drawings by DPT would be only to check compatibility with basic design and concepts and would in no way absolve the manufacturer/ fabricator / Contractor of his responsibility to meet applicable codes, specification and statutory rules/ regulations.

3.1.41 In case of any information not available in the tender but required for execution of the project as per site requirement, Contractor to execute the project as per site requirement.

3.1.42 Engineering Document Record (EDR) to be submitted by Contractor after award of contract for information. The EDR shall include no. of documents, document no., document description, revision no., submission date, certificates applicable, etc. as required during detail engineering. DPT / End User may add / delete any document from the EDR as deemed necessary. Contractor to revise and resubmit the EDR on time to time basis as and when any document is added / deleted.

3.1.43 Contractor shall furnish power consumption details with detailed break-up for each subsystem/equipments including inrush current and its duration, feeder details (230 V AC UPS, 230 V AC NON-UPS & 24 V DC & any other), etc. after award of contract.

### **3.2 Broad scope of work**

3.2.1 Bidder's scope of work for supply, erection, testing and commissioning shall include design, engineering, procurement, assembly, shop testing, inspection at works & at site; Factory acceptance tests, painting; packing; transportation to site, unloading, storage, erection, testing, calibration, pre commissioning, commissioning, site / final acceptance test, final handing over of the complete system of instrument / equipment and all associated hardware, as required in all respects for completeness & satisfactory stable operation of the plant for instrumentation works. The scope of work shall also include liquidation of defect points, participation in tests for





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establishment of plant performance guarantee (PG) and post commissioning activities till issue of final acceptance certificate.

Broad scope of work is given below and under each part of respective systems. However the responsibility for executing in line with total requirements of the detailed specification / P&ID, other drawing & documents etc shall lie with the bidder. The scope shall include –

3.2.2 Design, supply, erection, testing and commissioning of all the items required to make the systems complete in all respects and shall include all activities as listed below to meet the technical requirements as spelt out in this specification. Any items which are not explicitly spelt out here, but are required for the completeness of the work shall also be included under the respective items/systems.

3.2.3 Design, supply, erection, testing and commissioning of all items as per details / information available in the tender document. All supplies shall confirm to design basis, technical specification, datasheets and system architecture drawing enclosed with the tender.

3.2.4 Facilitating Inspection, FAT and Site acceptance activities as per relevant clause and support services to the third party installation team which would install the equipment / instruments.

3.2.5 Design, supply, erection, testing and commissioning of all types of Cables (signal, control, power, Fibre Optic (Single Mode Fibre & Multi Mode Fibre), communication & networking, telecommunication special cables) including dressing, ferruling, glanding and termination and Cabling accessories wherever required for laying of cables.

3.2.6 The total quantum of all types of cables required for the systems is included in the scope of work of the Bidder and elsewhere in the specification on lump-sum basis. They will be supplied and laid as per erection guidelines as indicated in relevant clause no. under general.

3.2.7 Supply and erection of Erection materials including pipe fittings, FRP cable trays with cover, cable racks, conduits, junction boxes, clamps, compression fitting, double compression cable glands, reducers for cable glands (exproof), instrument supports, channels, angles, local cabinets, Impulse pipes, GI conduits consumables and other materials for completeness of erection / required for testing and commissioning till handing over of the Plant.

3.2.8 Supply and erection of all material required for earthing of all the instruments and equipments. Scope involves interconnection with the main plant earth grid for equipment earth pits and for instrument earth pits.

3.2.9 Supply and erection of all consoles, racks, cabinets for mounting equipment and its Components.

3.2.10 Integration with third party / DPT system / equipment as detailed under relevant system description.

3.2.11 Preparation of design, detailed engineering and As-built drawings like GA, equipment layouts, cable route diagrams etc as indicated under each part.

3.2.12 Submission of weekly and monthly project progress reports in requisite format.





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### 3.2.13 Supply of Consumables (e.g. ink, papers for the printer) during commissioning.

#### Brief scope of work-

Sl.No	Description of Item
1	10 / 100 Fast Ethernet stackable manageable Switch along with accessories as per datasheet & shall comply the tender
2	Operator Interface Console (OIC) /Engineering Work Station (EWS) with monitor, mouse and Keyboard , dual ethernet cards complete alongwith accessories as per standard specifications & shall comply the tender.
3	Chairs along with accessories as per datasheet & shall comply the tender.
4	Emergency Shutdown Push Button (ESD PB) along with accessories as per datasheet & shall comply the tender
5	Temperature Element with Transmitter along with accessories as per site conditions. If required, Necessary modification in pipeline tapping for successful installation is in bidder's scope.
6	Pressure transmitter along with accessories as per site conditions. If required, Necessary modification in pipeline tapping for successful installation is in bidder's scope.
7	Pressure Gauge along with accessories (for Pumps and as per datasheet & shall comply the tender. If required, Necessary modification in pipeline tapping for successful installation is in bidder's scope.
8	Junction Boxes for all the cables used for items being supplied, indicated in PLCI/O list& system architecture including plugs for unused entries. (Terminal Layout & other drawings attached with tender may be referred for estimating the quantity. However, the Cable Layout & Cable Schedule for the same shall be submitted to DPT / for review/approval)
9	Cable tray with cover for signal, power, control, communication cable, etc. used for all the item being supplied, indicated in PLCI/O list & system architecture. (Terminal Layout & other drawings attached with tender may be referred for estimating the quantity. However, the Cable Layout & Cable Schedule for the same shall be submitted to DPT for review/approval)
10	Local Area Networking with CAT 6 structured Cabling with suitable end connections inside the building and FO cabling for networking outside buildings
11	Fabrication & Erection of Misc. structure of MS incl. supply of steel
12	Safety PLC with necessary accessories
13	RIO Panel with I/O Cards
14	Integration of HVLR with PLC
15	Provision of CCTV of 1080p to be erected at suitable height, electrical components, cables, control panels 2 at jetty



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#### 4. INSTRUCTIONS TO THE BIDDERS

Before submitting techno-commercial bids the bidder shall visit and study the locations and also the tender to understand the quantum of work at plant. Bidder shall visit site and assess the conditions prevailing before submitting the offer. Bidder shall furnish recommendations for grounding (Earthing) of the system supplied by him during detail engineering (Both in field and control room).

#### 5. INSTRUCTION TO SUCCESSFUL BIDDER

5.1 The bidder shall carry out day to day activity. A detailed project schedule shall be submitted listing out activities scheduled such that the materials and manpower can be planned accordingly. 5.2 The bidder shall ensure that all the safety procedures are followed during erection, testing and commissioning.

5.3 The bidder shall appoint an experienced Safety supervisor along with the supervisor appointed (for individual works) to carry out the day to day work. The safety supervisor shall be available throughout. In case the supervisor is unavailable for any reasons; a suitable replacement / substitute shall be present at site for supervising. Bidder shall appoint a supervisor who shall be available throughout the working time and shall be responsible for observing safety and security regulation of the terminal.

5.4 The successful Bidder has to Study, Analyze, Develop and Implement a suitable Tailor made Customized Application Software to cater for above objective. Required hardware, System Software and Networking which is required for smooth running of application package is also included in the scope of supply of bidder.

5.5 The Instruments / equipment shall be erected as per OEM recommendations.

5.6 Bidder shall furnish recommendations for grounding (Earthing) of the system supplied by him during detail engineering (Both in field and control room). Grounding system for the entire supplied system for protective, electronic earthing and providing suitable earth pits is in the scope of bidder.

5.7 Plant Layout & other drawings attached with tender may be referred for estimating the quantity. However, the Earthing Layout for the same shall be submitted to Employer.

5.8 Interfacing with other instrumentation system is also included in the scope of the bidder, details of which will be provided to successful bidder. The bidder shall be responsible for proper interfacing and all co-ordination with other vendors / system suppliers. The bidder shall plan all activities required for establishing the interfacing without any loss of time.

Contractor's scope of work shall be as broadly listed below regarding Instrumentation and control system on an EPC basis.

##### i) Design and Engineering

Contractor shall carryout design and engineering of Instrumentation and controls based on the P&I Diagrams, System architecture and other technical specifications as described in various sections of the Tender Document. Documents and drawings as listed elsewhere in this



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document shall be prepared by EPC Contractor and furnish for approval/ information/ records as a minimum. Any other document/ drawing not listed but required to carry out for engineering and for integration of other equipment / packages sub ordered by Contractor shall also be prepared and furnished for approval/ information.

The instrument data sheets and standard formats enclosed and other technical specifications of this Tender package shall be used for the purpose of preparing above mentioned documents / drawings. Wherever the data sheet / standard format is not available for any of the instruments, Contractor shall use ISA format for the same.

The design and engineering work shall also include review of post order vendor drawings and documents for all instrumentation items. The Contractor shall thoroughly review and approve vendor drawings for all instruments before forwarding.

## **ii) Procurement, Shop Testing and Supply**

All instruments shall be procured from the Approved Vendors listed elsewhere in the Tender Document. In case, any item is to be supplied from a vendor other than mentioned in the Approved Vendors List, the Contractor shall obtain prior written approval for the same before placement of order.

All equipments supplied shall be of field proven quality, both with respect to design and materials. No prototype instrument or instrument of an experimental nature shall be offered or supplied.

All the arrangements for shop testing and calibration of all Instrumentation items, control panels, cables, etc. shall be carried out by the Contractor. Owner / Consultant may carryout stage/ final inspection of any item before shipment/ installation.

## **iii) Installation, Field Calibration/ Testing & Commissioning**

Contractor shall carryout installation of all field mounted and control panel mounted instruments, control panels, etc. as described in relevant attachments attached with Tender Document. This activity shall include but not limited to installation of all field instruments and junction boxes, laying of single pair, multi pair cables from field to control room, laying of power supply cables from control room / switch gear room to the field, installation of panels in control room, earthing of all panels, field instruments and junction boxes, tagging and pair / core identification of all cables, calibration of all the panel and field mounted instruments, pre-commissioning checking including testing of impulse lines, instrument air lines, pneumatic signal tubes and cables, loop testing and commissioning of total system as per the requirements indicated in the Tender Document.

The description and requirements contained in this specification are indicated in brief and may not include all details. However, it is the responsibility of the Contractor to develop approval procedure and execute the job on a package basis in accordance with the job specifications, relevant codes, direction of the EIC and good engineering practices for smooth and successful operation of the plant.

The instrumentation works shall include, but not limited to the following to complete the works:



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a) Design, Engineering, Factory Inspection, packing, freight, transportation, insurance, Supply, Installation, testing, site calibration, pre-commissioning & commissioning of all **field instruments** as detailed in attached instrument list, P&ID, Technical Specifications, drawings, Datasheets and other attachments attached with tender documents.

b) Design, Engineering, Factory Inspection, packing, freight, transportation, insurance, Supply, Installation, testing, pre-commissioning & commissioning of PLC System (Jetty - 3) along with RIO panels & Where ever required (as per site requirement) with licensed software required for accommodation of signals from field instruments / panels / items/ 3rd party devices and panels/ instrumentation systems of other plants (like HVLR, Fire engines, Jockey pumps etc) etc. defined elsewhere in P&ID, Technical Specifications, drawings, Interfacing Signal list, Datasheets and other attachments of tender document. PLC System shall comprise of fully wired free standing panels which include processors, power supply units, I/O cards, relay modules, communication modules, interfacing modules, I/O racks, Ethernet switches (manageable & stackable), serial modules, any kind of signal converters , Terminal Server / Data Concentrator, media converters, MCBs, TBs, fuses, surge protection devices, signal distribution cards, annunciators, lamps, hooter cum strobe, etc. ; HMIs and licensed softwares for developing / modification of logics. Conversion of voltage level required to make the system operational is in Contractor's scope.

Software, anti-virus and hardware as required for complete system including subsystems required to meet the site functional requirement shall also be provided by the bidder. Soft licenses should be available for all the software provided. Dongle keys for running of software should be avoided.

3 nos LaserJet printers, with facility of printing in A4 and A3 sizes, along with printer tables shall be provided in `e Control Room.

Computer console / cabinets (as required) shall be provided for mounting all the computers located in the control room. The console shall have provision for drawers for keyboards, earth bus, fans, louvers and ant vibration pad. The console / cabinet shall be fabricated with CRCA Steel sheet. Console to be supplied with necessary dummy corner panels and shall fulfill the tender specification.

c) Design, Engineering, Factory Inspection, packing, transportation, Supply, Installation, testing of Erection Hardware which includes instrument valves & manifolds, SS tubes, instrument mounting accessories, impulse piping/ tubing, pipe/tube fittings, Junction Boxes, end plugs, spare plugs, cable glands, adaptors, ferrules, lugs, sleeves, MCT blocks, sealing compound (for sealing of any vacant space in the cable entry in the plant), rodent repellent, identification tags, conduits, structural material (required for supports of instrument, junction box, tubes, panels, trays, etc.), cable trays with cover & clamps, cable clamps, cable route markers, etc. required for installation of all the materials envisaged in the tender as per Technical Specifications, drawings, Datasheets and other attachments attached with tender document .

d) Design, Engineering, Supply, Installation, testing, pre-commissioning & commissioning of **instrumentation earthing system** which includes earthing cables / wires (for instrument cases & junction boxes) from individual items to earth grid, GI / copper strips (for grounding of PLC Panels in the control room) from individual item to earth pit, copper strips (for instruments bus



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bar in control panel) from individual item to earth pit, earth pits alongwith strips (both copper & GI) required to make the grid to fulfill the instrumentation earthing requirement. Separate earthing to be provided for electrical & instrumentation system.

e) Design, Engineering, Factory Inspection, packing, freight, transportation, insurance, Supply, laying, dressing, loop checking, megger testing, termination, testing of complete **Cabling System** which includes Cables (signal, control, power, system cables, Optical Fibre Cable, Ethernet cable etc.) between field instruments and junction boxes and further to PLC Panels, between PLC Panels and other interfacing devices envisaged in the tender document. Contractor to prepare and submit the cable schedule.

f) Multicables between junction boxes and Control Room shall be as per following philosophy:

i) For Signals (4-20mA): Stranded copper conductors having a minimum cross-sectional area of 1.5sq.mm shall be used. The number of pairs may be standardized as 4/6/8/12/16 pair, individually and overall shielded (screened), armoured, twisted, conductor cable, as per Technical Specification enclosed with tender.

ii) For Controls: Stranded copper conductors having a minimum cross-sectional area of 1.5sq.mm shall be used. The number of cores may be standardized as 3, 5, 7, 10, 14, 19, and 24 armoured, conductor cable as per Technical Specification enclosed with tender.

Contractor shall select junction boxes accordingly.

Contractor shall clearly state if any of the above cable does not suit vendor's instruments requirement and indicate type of the cable required. Contractor to furnish the regret communication from the vendor for the same and Contractor to absorb the price for the vendor's recommended cable at the offer stage price bid submission.

g) Separate JBs shall be considered for power, signal and control signals. Cable glands and end plugs for each entry of all the junction boxes shall be supplied by the contractor. Cable glands for the spare cable entries shall be supplied loose.

h) It is Contractor's responsibility to have commissioning spares as required for commissioning of total Instrumentation System. It is deemed to be included in his scope of supplies/ work.

i) Cable tray shall be considered for cables laid above ground and trench shall be considered for cables laid underground.

j) Cable glands shall be provided at both ends of each piece of cable.

k) Design, Engineering, packing, transportation, Supply, Installation of **Canopies** required for field electronic instruments as per Technical Specifications attached with tender document.

l) All civil works required to make the system ready are included in the Contractor's scope. The scope shall include but not limited to the followings:-

i. Civil Works at field i.e. associated grouting and fixing of all field instruments (transmitters, switches, J.B.s etc.), making trenches.





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ii. Civil work at Control Room i.e. any masonry work associated with the entry and ingress of the equipment inside the control rooms, including marking goods, painting and finishing such as masonry work, grouting and fixing of panels.

m) Hydraulic testing of instrument impulse lines (piping/tubing).

n) Supply & installation of Rodent repellents in cable trenches of field and control room.

o) The quantities indicated elsewhere in tender document is indicative and for tender purpose only. Quantities will be finalized during detail engineering.

p) All the items required to complete the work shall be the scope of supply of contractor only.

q) Contractor to note that wherever stainless steel is specified it refers to austenitic and / or ferrite steel.

r) In hazardous area applications, electronic/electrical instrumentation equipment shall be suitable for hazardous area classification as per IEC. These equipment shall be intrinsically safe conforming to CENELEC standard and certified by appropriate statutory bodies (ATEX, FM, BASEFA etc.). Intrinsically safe systems shall be designed using zener/ IS barriers. Where intrinsically safe design is not feasible, ex-proof equipment/enclosure, certified by statutory bodies like CMRI Dhanbad/ CCOE Nagpur shall be supplied. Other acceptable safety procedures (e.g. increased safety procedure, pressurization etc.) shall be used, wherever applicable. Required documentation/certificates shall be submitted in conformance with all such features.

s) All cable glands shall be double compression type and shall be provided with PVC hood. Cable glands shall be suitable for the cable dimensions with  $\pm 2$  mm tolerance.

t) All equipment to be supplied and all work to be performed including system design and engineering, shall comply with the statutory requirements of Government of India and the State Government.

u) The following documents shall be submitted by the Contractor for review/ approval/ information/ records.

1. Bill of Material
2. Material Requisition (MR) for all Instrumentation items
3. Functional Schematics (Block Diagram of Instrument Interconnection)
4. Instrument Index/ Summary
5. General Arrangement & Front Layout of Control Panel
6. Cable Layout Diagram alongwith Instrument and JB Locations
7. Cable Schedule
8. Control Room Layout Drawing



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9. Control Room Equipment/ Panel Foundation Details
10. False Flooring Detail
11. Power Supply Distribution/ Feeder Requirement
12. Loop Diagrams
13. Control Panel Wiring and Terminal Detail Drawing
14. Interlock Wiring Drawing
15. Instrument Power Consumption
16. Instrument Air Requirement
17. Instrument Mounting Detail
18. System Grounding Detail
19. Certificates (Statutory/ Test/ Calibration/ Inspection)
20. Installation, Operation & Maintenance Manuals
21. Spare List
22. Document Schedule
23. As-built Drawings/ Documents
24. Site Acceptance Test (SAT) Documents
25. Final Acceptance Test (FAT) Documents

**Notes:**

1. All the above documents, as applicable, are also required for the package units subordered by the Contractor.
2. Any other document / drawing not listed but required to carry out the engineering complete in all respects, shall also be prepared and furnished by the Contractor.
3. This list indicates the minimum drawings and document requirements. However, vendor shall submit a complete list of document and drawing schedule listing all the drawings and documents to be submitted by them during the course of execution of the job. The schedule shall list all drawings and documents along with their number and expected date of submission.





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## INDICATIVE SPECIFICATIONS FOR CONTROL PANEL & ACCESSORIES

### GENERAL

#### Site of Installation

- |                              |                                 |
|------------------------------|---------------------------------|
| 1. Plant and Location        | : As per P & ID                 |
| 3. Location of control panel | : Control Room and accessories. |
| 4. Floor                     | : Concrete                      |
| 5. Air Conditioning          | : Yes                           |
| 6. Control Panels Quantity   | : As per SOR                    |

#### **Scope of Work:**

- a) Supply of Control Panel (free standing, cubicle type) along with all accessories like Power Supply Distribution Box (PDB), Lamps, MCBs, Relays, Barriers / Isolators, Selector Switch, Signal Multipliers (SDC), etc. as per this Technical specification.
- b) Separate Terminal Blocks shall be provided for RTU signals with 20% spare terminals. All the signals shall be available at RTU TBs.
- c) Quantities of control panel accessories (Push Buttons, Lamps, Relays, Zener Barriers, and SDC Cards etc.) shall be as per the Technical Requirements during drawing approval/detail engineering.
- d) Mounting heights:



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i) Miniature and subminiature	Bottom row	1100mm
Instruments (3 rows)	Middle row	1350mm
	Top row	1600mm
ii) Electric push buttons	--	700mm

### INST CONTROL PANEL CONSTRUCTION

1. Type : Self-supported, Free Standing, enclosed cubicle and Nongraphic.
2. Lighting : Required for inside panel with door switch.
3. Ventilation : Required with louvers backed by wire fly screen & fan. Fan Failure Alarm required
4. Doors : Glass doors in the front of the Panel with locking arrangement.
5. Door width : Each max. of 600mm and shall suit width of the panel. Panel width is indicative only. The sizes shall be sufficient to accommodate the required hardware specified in MR. However the depth and height shall be 800 & 2200 respectively.
6. Cable Entry : Bottom, Cable Glands shall be double compression type for external armoured cables. All unused entries shall be plugged.
7. Receptacles : Required for 230VAC (UPS).
8. Painting : The finish shall include sand blasting, grinding, chemical cleaning, surfacefinishing by suitable filter and two coats of high grade lacquer with wet sanding between coats.. Two coats of paint in panel colour shall be given for Non-glossy high stain finish. Panel face final colour shall be of the following:



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- a) Siemens Grey (RAL 7032)
- b) Panel internal shall have a finish color of pale cream – IS 352
- c) Channel Base shall have a finish color of black
- 9. Channel Base : 100X50X6 MM, MS material
- 10. Name Plates : Front of Panel Instrument name plates shall be black laminated plastic with white core. Nameplate shall be provided on the rear of the panel also.

### 11 Dimensions & Material of Construction

- a) Panel dimension : 2115 (mm) H (including 100 mm base + 15 mm anti-vibration pad) x 1200 (mm) W x 800 (mm) D (Finalized during detail engineering).
- b) Control Panel : 3 mm thick CRCA steel/5.0 mm thick HRCA steel, Welded to frame
- c) Side & Top plates : 2 mm thick CRCA steel, Welded to frame
- d) Door panel : Glass doors in the front of the Panel
- e) Cable gland plate : 3 mm thick CRCA steel
- f) Anchor Bolt Size : By vendor
- g) Lifting Eye Bolt : Required
- h) Anti Vibration Pad : Required (15mm thick rubber pad).

#### **Note:**

**\*Panel shall be electrically isolated from base frame.**

### 12 WIRING

**a) Type:** General purpose, Intrinsically safe

#### **b) Wiring details**

110 VAC UPS Wiring

External to Cabinet : Min. 3x2.5 mm<sup>2</sup>/copper conductor PVC insulated armoured

Inside the cabinet : Min. 19 Strands, 16 AWG copper conductor PVC insulated

230 VAC Wiring (Non UPS) : 3x2.5mm<sup>2</sup> copper conductor PVC insulated armoured

Low Voltage internal : Min. 19 Strands, 16 AWG copper conductor PVC insulated to cabinet



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### c) Signal Wiring

External to Cabinet : 1.0 mm<sup>2</sup> twin twisted individual shielded overall shielded with overall drain PVC insulated armoured

Inside the cabinet : Multi stranded min. 1.0 mm<sup>2</sup> copper conductor PVC insulated twin twisted and shielded

**d) Terminal type** : Screw clamp type with Pressure Plate

Terminal size for signal : Suitable for min. 2.5 mm<sup>2</sup> size conductor

Terminal size for power dist. : Suitable for min. 4.0 mm<sup>2</sup> size conductor and higher as per actual cable sizes.

Terminal block : Clip-on type

### e) Wiring colour code

Power Supply : Hot – Red, Neutral - Black, Earth – Green

DC Wiring : Positive – Red, Negative – Black

Alarm System : White

Control & shutdown : Yellow

Analog signals (IS) : Light blue

Identification of Cable

Termination : Criss – Crossing PVC tube ferruling.

**f) Power Indication Lamps:** 230VAC UPS – Red color, 230VAC NUPS – Red Color 24VDC – Green Color

**Note: Dedicated terminal for SCADA has to be Provided**

### A) POWER SUPPLY DISTRIBUTION BOXES FOR PANELS

1. Function : Distribute power to Individual instruments

2. Mounting : Mounted at the panel inside

3. Door : Front single door

4. Painting : As per panel painting specifications.

### 5. Dimensions and material construction



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- 5.1. Box dimension : By vendor.
- 5.2 Box plate thickness : 3mm hot rolled steel.
6. Cable entry : By vendor
7. Accessories : 600V Grade DPST MCB for power Distribution and SP MCB for barriers& Suitable MCB for Control panel Instruments
8. Special requirements : MCBs for incoming feeder.

#### **B) BULK POWER SUPPLY UNIT**

1. Input : 230 V AC, 50 Hz.
2. Output : 24 V
3. Rating : By Vendor
4. Quantity : Dual Redundant as per requirement

#### **SPECIFICATIONS FOR ACCESSORIES**

##### **1. MCB**

- Make : HAVELL'S/ INDO ASIAN/ MDS.
- Qty. : As required + 20% spare

##### **2. Lamps**

- Type : LED Clustered Type
- Voltage : 24 VDC
- Make / Model No. : SIEMENS / L & T
- Quantity : As required + 20% spare

##### **3. Relays**

- Type : Plug in relays
- Contact Type : Potential free contact
- Contact No. : 3 NO. + 3 NC
- Rating : 24V DC, 5.0 A
- Make / Model No. : OEN/ OMRON.
- Quantity : As required + 20% spare



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#### 4. Space Heater

Rating : 60W, 230 V AC with Thermostat.

Make : KEC

#### 5. Power Supply Unit:

Make / Model No. : ELNOVA/ APLAB

SPECIFICATION FOR SIGNAL DISTRIBUTION CARDS		
SL.NO.	DESCRIPTION	DETAILS
1.	TYPE	DUAL OUTPUT CURRENT ISOLATOR
2.	INPUT	4-20 mA D.C
3.	OUTPUT	TWO NOS. 4-20 mA ISOLATED OUTPUTS AS MINIMUM
4.	ISOLATION	BETWEEN INPUT & OUTPUT, BETWEEN INPUT & OUTPUT WITH POWER SUPPLY, BETWEEN OUTPUT & OUTPUT
5.	ACCURACY	± 0.1%
6.	POWER SUPPLY	24 V D.C
7.	TRANSMITTER POWER SUPPLY	24 V D.C
8.	OUTPUT LOAD DRIVING CAPACITY	600 Ohms MINIMUM FOR EACH OUTPUT
9.	MOUNTING	DIN RAIL (BACK OF THE PANEL)
10.	MAKE	MTL / P&F
11.	MODEL NO	*
<b>NOTES:-</b>		
* - BY VENDOR		

SPECIFICATION FOR ISOLATING BARRIERS		
SL.NO.	DESCRIPTION	DETAILS
1.	TYPE	SHUNT DIODE SAFETY BARRIER
2.	APPLICATION INSTRUMENT TYPE & QUANTITY	(i) 4-20 mA Analog I/P from 2 wire transmitter– As required + 20% Spare (ii) 4-20 mA Analog O/P to I/P Converter – As required +20% Spare
3.	HAZARDOUS AREA CLASSIFICATION	ZONE-I, GR. I, IIA & IIB, T3
4.	APPROVAL AUTHORITY	FM/BASEEFA/CSA/SA/CMRS
5.	SUPPLY VOLTAGE	24 V DC



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6.	FUSE RATING	*
7.	END TO END RESISTANCE	*
8.	POLARITY	*
9.	MOUNTING	DIN RAIL (BACK OF THE PANEL)
10.	OPERATING TEMP	0 TO 60° C
11.	OPEN CIRCUIT VOLTAGE	*
12.	SHORT CIRCUIT CURRENT	*
14.	MAKE	MTL/P&F
15.	MODEL NO	*
<b>NOTES:-</b>		
* - BY VENDOR		

SPECIFICATION FOR ISOLATING BARRIERS		
SL.NO.	DESCRIPTION	DETAILS
1.	TYPE	SHUNT DIODE SAFETY BARRIER
2.	APPLICATION INSTRUMENT TYPE & QUANTITY	4-20 mA Analog I/P from Temperature Transmitter
3.	HAZARDOUS AREA CLASSIFICATION	. ZONE-I, GR. I, IIA & IIB, T3
4.	APPROVAL AUTHORITY	FM/BASEEFA/CSA/SA/CMRS
5.	SUPPLY VOLTAGE	24VdC
6.	FUSE RATING	*
7.	END TO END RESISTANCE	*
8.	POLARITY	*
9.	MOUNTING	DIN RAIL (BACK OF THE PANEL)
10.	OPERATING TEMP	0 TO 65° C
11.	OPEN CIRCUIT VOLTAGE	*
12.	SHORT CIRCUIT CURRENT	*
13.	MAKE	<b>MTL/P&amp;F</b>
14.	MODEL NO	*
<b>NOTES:-</b> * --By Vendor		

SPECIFICATION FOR ISOLATING BARRIERS		
SL.NO.	DESCRIPTION	DETAILS
1.	TYPE	SHUNT DIODE SAFETY BARRIER
2.	APPLICATION INSTRUMENT TYPE & QUANTITY	Limit switches (SPDT snap action Micro type) - As required + 20% Spare





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3	HAZARDOUS AREA CLASSIFICATION	. ZONE-I, GR. I, IIA & IIB, T3
4.	APPROVAL AUTHORITY	FM/BASEEFA/CSA/SA/CMRS
5.	SUPPLY VOLTAGE	24VdC
6.	FUSE RATING	*
7.	END TO END RESISTANCE	*
8.	POLARITY	*
9.	MOUNTING	DIN RAIL (BACK OF THE PANEL)
10.	OPERATING TEMP	0 TO 60° C
11.	OPEN CIRCUIT VOLTAGE	*
12.	SHORT CIRCUIT CURRENT	*
13.	MAKE	MTL/P&F
14.	MODEL NO	*

**NOTES:-** \* --By Vendor

SPECIFICATIONS FOR INDICATORS		
SL .NO	DESCRIPTION	TECHNICAL REQUIREMENTS
1.0	Type	Microprocessor based dual channel indication
2.0	Mounting	Flush Panel
3.0	Enclosure	General Purpose
4.0	To be used in intrinsically safe system	With Extl. Zener Barrier/Isolator
5.0	Power for transmitters	24V DC (From Bulk Power Supply/SDC)
6.0	Inputs	4-20mA DC (2 wire)
7.0	Outputs	4-20mA DC
8.0	Capacity	No. of Analog inputs Other inputs Other outputs-Retransmission Max. No. of Alarms settings
9.0	Facia Details	Bar graph display with 4 digit 7 segment LCD/LED digital display of PV.
9.1	Indications	Continuous Bargraph Digital Required for Process variable
10.0	Scan time	500 msec. Max
11.0	A/D converter Resolution	1500 steps min.
12.0	D/A converter Resolution	1500 steps min.
13.0	Load driving capability	750 ohms
14.0	Configuration	From Indicator
15.0	On line diagnostic	Required



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	messages	
16.0	Memory type	If retentive: - Erasive Erasing by If volatile: - Battery backup for min. 72 hrs. Battery type chargeable Continuous. Battery type chargeable Configuration protection time (In case of power failure) Battery drain indication required.
17.0	Indicator functions Arithmetic functions  Linearization	Addition / Subtraction Multiplication Division Square Root Bias Summation (Integration) Sq. Root Extraction Flow computation (Press and Temp. compensation)
18.0	Power supply	24 V DC
19.0	Accuracy	+/- 0.5%
20.0	Repeatability	+ / - 0.5 %
21.0	Qty. & Tag No.	As per P& ID
22.0	Make & Model	

ITEM NO.	TAG NO.	SCALE GRADN.	M.F.	SERVICE	REMARKS
1.	TI - ***	*	*		24 V DC Power Supply
2.	PI - ***	*	*		24 V DC Power Supply
* - BY VENDOR , ' *** ' Tag Nos. & Quantities shall be as per P&ID					

**Note-** The above listed specifications are minimum indicative requirements. However, the EPC Contractor has to submit the specifications during Detailed Engineering.

## 8.0 Void

## 9.0 PACKING & DESPATCH

9.1 The Tenderer shall provide for secured packing of all equipment and piping to protect from damage during transit from point of manufacture up to the site of erection under conditions



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which may involve multiple handling, storage and exposure to heat, moisture, rains, etc. The Tenderer shall refer to the guidelines in this regard as enshrined in GCC.

9.2 All equipment and parts shall be tagged with reference to the assembly drawings and corresponding part numbers before packing and despatch.

9.3 All openings in valves, pipes and other materials shall be protected by suitable covers or plugs.

9.4 All packages shall be clearly and properly marked in English language with indelible paint by stenciling. The identification marks indicating the name and address of the consignee shall be clearly marked on two sides and top of each package. Gross and net weights, outer dimensions and volumetric measurements shall be included in the marking. Eye bolts, lifting hooks or brackets shall be provided for lifting the boxes, crates and packages.

9.5 Every crate or package shall contain a packing list in a waterproof envelope. A duplicate copy of the packing list shall be sent by post to the DPT. All items of equipment shall be clearly marked for identification against the packing list.

9.6 Cases containing rubber rings, bolts and other small items shall not normally weigh more than 50 kg gross per case.

9.7 Electrical equipment shall be enclosed in sealed air-tight package with hygroscopic material, before being placed in packing cases on shock absorbent materials and secured by means of battens.

9.8 The Tenderer shall be responsible for checking all the materials delivered to the site and shall keep the DPT fully informed of the state of deliveries. The Tenderer shall carry out proper unloading, preservation, maintenance, storage and security of materials delivered to the site.

9.9 The Tenderer shall erect and maintain on the site any temporary storage facility as required and approved by the DPT.

## **10.0 ERECTION, SITE TESTING, COMMISSIONING, PERFORMANCE GUARANTEE TEST & FINAL ACCEPTANCE**

10.1 The erection work shall be carried out according to the sound established engineering practice and as per the drawings and specifications duly approved by DPT. The Tenderer shall carry out the erection and commissioning of process equipment under the supervision of equipment supplier and erection manual considering site safety and statutory requirements. The Tenderer shall carry out the work in the presence and/or as per the instructions of the site engineer/ supervisory personnel deputed by the DPT. The Tenderer shall furnish detailed organization chart for erection, testing, trial run and commissioning work showing lines of authorities and responsibility and functions of all key personnel. The Tenderer shall not remove any engineer, erector or skilled labour from the site without prior written approval of the DPT.

10.2 The Tenderer shall take care of positioning, leveling and plumbing of all pipelines and equipment within required accuracy and tolerance limits. All site routed pipelines shall be laid avoiding interference with technological structures and equipment and without obstructing



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walkways and working space keeping in view their accessibility for manual operation and maintenance.

10.3 It shall be deemed as a contractual obligation that the pipes are not thrown out of alignment or lifted off during commissioning and subsequent operation.

10.4 Before erection, all equipment, pipes, valves, fittings, etc. shall be thoroughly cleaned and all scales, rust, dirt, oil, grease, etc. shall be removed from inside surface. The Tenderer shall provide all cleaning materials.

10.5 Before welding of pipes, rust, scale and dirt shall be cleaned off by metal brushing for a distance of 30-40 mm from the pipe ends.

10.6 The Tenderer shall be responsible for paying strict attention of statutory regulations for prevention of accidents and to other safety rules. In addition, the Tenderer shall follow all the relevant erection clauses/conditions stated elsewhere in the technical specification.

10.7 The Tenderer shall supply all required consumables, construction and erection materials, petrol, diesel, oil, kerosene, solvents, sealing compound, tapes, brazing and soldering materials, welding and brazing gases, erection bolts, nuts, gaskets and packing sheets/ compounds, temporary supports, wooden blocks, spacers, shoring materials, templates, jute and cotton wastes, sand and emery papers, welding electrodes, Radiography Films etc. as required for the satisfactory completion of work.

10.8 Except where otherwise specified, all piping shall have butt welded connections with a minimum of flanged joints except for connections to equipment and valves. Branches shall, in general be formed by welding.

10.9 The Tenderer shall make his own arrangement for handling the equipment and pipelines at the stores for transporting and positioning them at the site of installation.

10.10 VOID

10.11 Wherever pipeline route crosses under road, pipes shall be protected by providing suitable encasing pipes (Hume/steel).

10.12 Buried pipelines shall be laid as far as possible at a minimum depth of about 1.2 m below finished ground level (i.e. the top of the pipelines shall be 1.2 m below the finished ground level).

10.13 The Tenderer shall arrange at his cost all tools, plant, welding transformers, instruments and consumables including any acetylene and oxygen gas cylinders, welding electrodes for electric arc welding and filler rods, fluxes etc. for gas welding for carrying out the welding at site. Welding shall be carried out as per welding specification chart enclosed elsewhere in tender.

10.14 Laying and jointing of welded carbon steel pipes and stainless steel pipe shall generally conform to the guidelines enshrined in welding specification enclosed elsewhere in tender. The Tenderer shall mobilize adequate resources, viz. Pipe handling equipment, machinery, labour, alignment instruments, etc. for smooth pipe laying operation in scheduled time frame. The Tenderer shall furnish the list of the aforesaid resources to the DPT along with his offer.



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### 10.15 Erection of Equipment

10.15.1 The foundation slab shall be checked in order to have sufficient clearance between the lower surface of the machine and the foundation slab for the sealing compound and the shims.

10.15.2 The foundation holes for the anchor bolts shall be free and clean and must have been checked for correct positioning in relation to the machine axes as well as for the depth to the elevation points, before erection work is undertaken.

#### 10.15.3 Clean up, Assembly & Installation

a) The foundation bases shall be cleaned by water and compressed air to expose the surface.

b) The top of the concrete foundations shall be thoroughly cleaned with air or air and water jet prior to placing of equipment on foundations. Concrete surface shall be roughed up by chipping uniformly and the surface shall be washed clean with jet of water to remove fine dust.

c) The Tenderer shall place bed plates, cover plates, sole or sub-sole plates on the foundations and shims inserted until the equipment is in level as checked with precision machinist's levels. Required shim stocks, machined steel wedges, if required, shall be furnished by the Tenderer and used in sufficient numbers to avoid unsupported spans with any perceptible deflection.

#### 10.15.4 Alignment, Leveling & Grouting

The machined base shall be cleaned with a solvent, e.g. kerosene, etc. The equipment shall be placed over the base plate taking care of the foundation bolts. They shall be then aligned with reference to the axes and levelled with the help of shims or any other suitable devices. The lines, levels and alignments of all installed equipment and structural steel work shall be ensured to be within such tolerances as are recommended in the respective equipment manufacturer's instructions.

10.15.5 All required adjustments shall be made by the Tenderer as directed by the equipment manufacturer. The Tenderer shall make permanent datum marks on the floors/ permanent structures after installation of all equipment. These marks shall be subject to inspection by the site engineer are intended to ensure proper alignment and levelling of equipment re assembly after maintenance/overhaul, etc.

10.15.6 After the equipment/ structure, etc. have been installed, lined, levelled and aligned, the foundation bolts shall be pulled up tightly and the equipment shall be grouted with shrimkomp grout (ACC make) and grouting cured for seven days. When the grout is thoroughly cured, the alignment shall be rechecked. All grouting material including shrimkomp grout shall be supplied by the Tenderer.

### 10.16 Erection of Valves

10.16.1 Before erection of valves, it shall be ensured that:

a) All grit and foreign matter are removed from the inside of the valves before connecting the pipes.

b) All the faces are thoroughly cleaned and coated with a thin layer of mineral grease.



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10.16.2 Gate valves shall normally be installed with the spindle vertical except on vertical pipes where the spindle shall be horizontal. On slopes, the sluice valves may preferably be kept vertical if slope is nominal and gradient can be adjusted with the help of pipes on both sides.

10.16.3 The valves should be tightly closed when being installed, to prevent any foreign matter from getting in between the working parts of valves.

10.16.4 It shall be ensured that the joining material sits squarely between the flanges of valves and pipelines without obstructing the flow of fluid.

10.16.5 After erection, all equipment having moving part, subject to pressures or voltages shall be given trial operation. The trial operation shall consist of 24 hours of continuous operation. All modifications and rectifications required during the trial operation or required for proper operation shall be done at his own cost by the Tenderer as accepted by the DPT.

10.16.6 Provision of special tools and tackles and necessary man power for construction, erection, operation and repair/maintenance of the plant and equipment.

10.16.7 On completion of the work, the Tenderer shall remove and dispose off all rubbish and other unsightly materials caused by his working to a designated place from the proposed plant area or as directed by the DPT and thereby leaving the premises in good, clean, safe and operable condition.

10.16.8 All the equipment shall be subject to stage inspection by the successful Tenderer's own inspecting authority. However, DPT's Inspector may visit the works from time to time that shall have free access to all the places of the manufacturing premises where any part/parts are under manufacturing.

10.16.9 The successful Tenderer's inspecting authority shall keep a close surveillance in respect of the job for the design, dimensions, tolerances, surface finish etc.

10.16.10 Before giving call for final inspection, all the documents shall be furnished to the DPT. The record of manufacturing details, inspection and tests carried out by the successful Tenderer shall be made available to the final Inspecting Authority. However, approval and final inspection at the manufacturing works shall not relieve the successful Tenderer of responsibility of replacing at his cost any defective part/material which may be detected by the DPT during erection and commissioning or guarantee period. 10.16.11 Inspection of the item will be carried out in line with the approved QAP of the Purchase Order.

10.16.12 All materials required for fabrication, construction, testing and inspection shall be supplied by the Tenderer. No material shall be free issue to the Tenderer.

10.16.13 The test shall be conducted at shop for various sub-assemblies/assemblies of equipment as per common industrial practices, unless otherwise specified. Extent of testing shall be finalized during formulation of detailed QAP.

10.16.14 All inspection shall be carried out at the manufacturer's shop/works.

10.16.15 No equipment or part item shall be dispatched without final inspection and issuance of inspection certificate / inspection waiver certificate.





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10.16.16 All equipment, assemblies, sub-assemblies shall be shop tested as per relevant standards and the test certificates shall be submitted by the supplier.

10.16.17 Erection, testing & commissioning of various equipments and piping etc shall be done also in line with details given in various chapters Technical Specification / Tender.

### 10.17 Site Painting

10.17.1 After erection and testing, all equipment and material that have been finish painted at the manufacturer's works shall be touched up for any damaged paint work. All items of equipment and material shall be examined for any damage to the paint coat applied at manufacturer's works and any damaged portion shall be cleaned down to the bare metal, all rust removed and the paint coat made good with identical paint. If necessary, equipment having full painting shall be given one finish coat compatible with shop coats after necessary cleaning and touch-up.

10.17.2 Surfaces which have not been shop coated but require to be painted, shall be given the necessary surface preparation and prime coat before application of intermediate and finish coats and before any damage occur to the surface from weather or other exposure.

10.17.3 All piping shall be painted after proper surface preparation as per the scheme furnished in general specification on painting and as per requirement and approval of DPT.

10.17.4 Colour Code Shades of finish coat to be applied shall be DPT standard and of wide acceptability. Prior approval shall be taken from the DPT after placement of order before adopting final color shade for any particular item being painted.

The Tenderer shall furnish paint manufacturer's technical data sheet pertaining to the paint selected. The data sheet shall inter-alia indicate the relevant standards, if any, composition in weight percentage of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash point, method of application, quality of surface preparation required, corrosion resistance properties and colour shades available.

### 10.18 Testing

10.18.1 The Successful Tenderer shall submit detailed procedure for Preliminary Acceptance test (PAT), commissioning and performance guarantee test (PGT) for the DPT review at least one month before completion of erection work. A detailed schedule showing the time sequence which the Successful Tenderer plans to follow for various steps in completion of trial run, commissioning and performance tests of each phase and integrated system shall be submitted.

10.18.2 Upon completion of erection, mechanical check and tests shall be carried out on each equipment and system according to the check list to be prepared by the Tenderer. Mechanical check and tests shall be performed to establish the following:

- i) The system is erected in accordance with the approved drawings of the Tenderer for the system.
- ii) Applicable codes and standards are followed for materials and workmanship.





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10.18.3 Stuffing boxes and glands shall be checked for sufficient rings or packing and tightness of packing gland. Seal oil system wherever provided shall be checked for cleanliness and proper operation.

10.18.4 All flanges, inlet and outlet connections shall be checked for tightness. Connections requiring gaskets shall be tightened evenly all round to ensure equal stress over the entire gasket area.

10.18.5 In case of motor driven machinery, motors shall be decoupled and turned over to the electrical team for testing and no-load running of motors. After no-load runs of motors, the Tenderer shall recouple the motors to the equipment and recheck the alignment.

10.18.6 All protective and safety guards shall be installed and equipment shall be checked for free movement by hand rotation. Rotating equipment shall be checked for proper direction of rotation and shaft alignment.

10.18.7 Sequence checking of all control systems, cable connections, checking of all interlocks and protective devices shall be done by the Tenderer.

10.18.8 Since it is a new system, it is quite possible that the pipeline may be fouled with cement, deposits, grease, oil and other suspended matters. As such, entire pipeline shall be thoroughly flushed for removal of foreign materials from the system. Flushing shall be continued till the system is completely cleaned. During flushing, valves and appurtenances shall be isolated and bypassed where necessary.

## 10.19 ACCEPTANCE OF THE SYSTEM

### 10.19.1 PRILIMINARY ACCEPTANCE TEST (PAT)

10.19.1.1 On completion of erection of pipes and facilities, Preliminary Acceptance Test (Cold Tests) shall be taken up by the Successful Bidder to establish that the various facilities and equipment that have been supplied & erected as per the Tender specification & scope of work and after erection are fit to be operated and commissioned. Each pipeline shall be subjected to Preliminary acceptance before putting into commissioning/ operation. Requirement of manpower for PAT shall be provided by the Bidder.

10.19.1.2 The PAT shall be commenced only after the approval of the Engineer-in-Charge of the DPT. All equipment shall be subjected to PAT for a period as agreed mutually in detail procedure of PAT.

10.19.1.3 Cold test shall be performed on the individual pipe system in consultation with the DPT. Cold tests shall be designed to conduct systematic check of the components and of the functional operation thereof. PAT shall comprise idle, no-load and part-load trial runs, as applicable.

10.19.1.4 After getting PAT clearance of individual pipe, subsequent commissioning and PG test shall be carried out for the same pipe.



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10.19.1.5 The PAT shall be conducted by the bidder under its sole responsibility and employing its own personnel. The DPT supervisory personnel and skilled operating personnel shall, however, witness the trial runs.

10.19.1.6 The list of defects and / or deficiencies, indicated / listed by the DPT to the Contractor during trial runs during PAT shall be liquidated by the successful Bidder to the satisfaction of DPT.

10.19.1.7 On successful completion of Preliminary Acceptance Test for pipe/equipment, Preliminary Acceptance Certificates shall be issued by the DPT.

10.19.1.8 PAT report for pipeline/equipment (format to be reviewed by DPT) shall be prepared by the Tenderer containing all relevant details and shall be submitted to the Engineer-in-Charge of the DPT.

#### 10.19.2 Commissioning

After getting PAT clearance for pipeline/equipment, the successful Bidder shall start-up and commissions the pipe/equipment.

10.19.2.1 All machinery and equipment shall be satisfactory performance as required in this specification and in accordance with relevant clauses of the commercial document.

10.19.2.2 During the startup and commissioning, the Contractor shall perform the required adoption, adjustment and hot run the plant & equipment to demonstrate its capacity.

10.19.2.3 The Bidder shall supply commissioning spares and oil, grease, lubricants & chemicals required for commissioning.

10.19.2.4 The plant and equipment shall be considered commissioned only after the successful performance guarantee tests are carried out by the Contractor. The warranty clause shall be operative only after the completion of successful guarantee tests

10.19.2.5 The list of defects and / or deficiencies, indicated / listed by the DPT to the Contractor during trial runs during PAT shall be liquidated by the successful Bidder to the satisfaction of DPT

10.19.2.6 Certificate shall be issued by the DPT after commissioning.

#### 10.20 Performance guarantee and Final Acceptance

##### 10.20.1 Performance guarantee

10.20.2 The Bidder shall offer for carrying out performance test on pipelines and associated equipment supplied by him for conducting of the Performance Guarantee Test. The starting time of the Performance Guarantee Test shall be mutually agreed upon in writing between DPT and the Successful Bidder.

10.20.3 Performance Guarantee test shall be conducted to establish minimum guaranteed operation of rated capacity with desired parameters for 4 hours. Other terms and conditions of



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PG Test shall be as stipulated in the relevant clauses of the specification or Commercial Volume or as may be mutually agreed in writing by the DPT and the Bidder prior to PG test.

10.20.4 Details of the performance tests, test procedures and test schedules for the demonstration of the performance guarantee shall be submitted to the DPT and shall be mutually agreed upon.

10.20.5 DPT reserves the option to reject / retain the equipment / system. In case the option "to reject " is exercised by DPT, the Bidder shall replace the rejected equipment / system by new ones at no extra cost within a period of time as indicated by DPT.

10.20.6 In the event of rejection, the faulty equipment shall be retained until a new replacement arrives at site for erection. It should be noted that as the faulty equipment has not been accepted and not taken over by DPT, the responsibility for it lies entirely with the Supplier. During this period, the Bidder shall not limit the use of faulty equipment except for reasons of safety during operation both for personnel and equipment.

10.20.7 Performance guarantee test certificate shall be issued after successful PG test.

### **10.20.2 Final Acceptance**

10.20.2.1 As soon as all works in respect of commissioning / performance guarantee tests are completed, the bidder shall so notify the engineer in writing for issue of FAC. Final acceptance shall occur in respect of the facilities when:

(a) The performance guarantee tests have been successfully completed and the guaranteed output and other parameters are met by the successful Bidder, or the amount of liquidated damages specified in the specification, if recoverable, has been recovered by the DPT.

(b) The successful Bidder has fulfilled all the obligations under the specification.

(c) Submission of final documentation, if any, including latest modification in "As built drawings" to DPT.

(d) After successful Testing, commissioning and handing over the entire Facilities, the AMC was a period of five years shall start including defect liability period of one year.

(e) The successful Bidder has liquidated to the satisfaction of DPT and as per requirement all objections/ observations mentioned during PAT, commissioning and PG Tests.

10.20.2.2 At any time after the events set out in the tender document hereof, have occurred, the Successful Bidder may give a notice to the DPT requesting for the issue of Final Acceptance Certificate (FAC).

### **10.20.3 Handing Over**

After successful completion of PG test of the system, project team of the successful bidder will hand over the same pipeline and associated facilities to operation team after completion of all other obligations stipulated in tender document. Operation team of the bidder shall then be responsible for the care & custody of the facilities together with the risk of loss or damage thereto, and shall thereafter take over the facilities.



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The DPT shall have the right to take possession or use any completed or partially completed work. Such possession or use shall not be deemed to be in acceptance of any work not done in accordance with the Contract with successful Bidder.

## **11.0 PROJECT IMPLEMENTATION SCHEDULE & PROGRESS MONITORING**

11.1 The project envisages replacement and revamping of firefighting system at oil jetty area at Deendayal Port Authority under Engineering, Procurement and construction (EPC) mode. Replacement and revamping Fire protection system at oil jetty area including design and engineering, manufacturing, delivery, Dismantling works, structural fabrication and erection including technological structures, erection of pipeline network, equipment etc. and testing and commissioning, shall be completed within 18 months from date of issuance of work order.

### **11.2 Project Schedule**

11.2.1 The Bidder shall submit the following along with the offer.

#### **i) Overall bar-chart schedule**

The heads to be covered in the schedules shall broadly be as follows:

- Basic engineering and approval
- Preparation and issue of ordering / technical specifications for sub-vendors
- Placement of orders on sub-vendors
- Detailed design engineering and approval
- Submission and approval of drawings
- Manufacture and supply of pipeline and other equipment etc.
- Fabrication and supply of structural including technological structures
- Dismantling Works
- Civil work including piling (if required)
- Erection of structures including technological structures
- Erection of pipeline network & Mechanical Equipment etc.
- Erection of Electrical Plant & Equipment etc.
- Testing and commissioning

The major milestones for the project are to be highlighted in the schedule.

#### **ii) Off-site/ on-site organization chart for execution of the project**

**11.2.2 The bidder shall have to submit the following documents during signing of the contract**



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- i) Deployment schedule of construction / erection man power
- ii) Deployment of schedules construction & erection equipment and machinery, tools & tackles, etc,
- iii) Off-site/On-site organization chart

### **11.2.3 The bidder shall have to submit the following after signing of contract**

- i) The Detailed project schedule both in hard and editable soft copy (in MS Project/Primavera) covering further details of construction, fabrication and erection activities, area-wise, within 1 month of effective date of contract for approval and finalization by the Purchaser / Consultant.
- ii) The format of progress report to be discussed and agreed upon within 1 month of effective date of contract.
- iii) Updated Detailed project schedule along with progress reports (on approved format) to be submitted every month.
- iv) The erection micro schedule for execution stage is to be submitted before 2 months of start of erection at site. However, the micro schedule shall only cover the critical areas.

### **11.3 Progress Monitoring**

11.3.1 An effective system of progress monitoring is to be evolved to ensure timely completion of all project activities. In general, progresses of the following major activities are to be reported.

- Issue of ordering / technical specifications and placement of orders on sub vendors for bought out items / components
- Detailed design and engineering including submission of drawings and their approval.
- Manufacturing activities at the works of the Bidders / associates / sub vendors.
- The progress report on inspection status.
- Dispatch of equipment to site.
- Site activities including receipt of material / equipment at site, erection, testing and commissioning.

A monthly progress report showing current status of various activities including status of ordered / yet to be ordered items shall be submitted to the Purchaser / or his consultants by the contractor. The monthly progress report shall also indicate progress of activities against targeted dates and targeted quantities. Reasons for shortfalls, if any, shall be clearly brought out and proposed remedial measures to arrest the delays shall be indicated by the contractor in the progress report, wherever applicable.

The contractor shall submit a schedule for site-execution, along with quantitative program in terms of month-wise physical targets for various disciplines of work, two months before start of site activities. After the site activities are started, the contractor shall furnish information on site



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activities viz: daily, weekly and monthly progress reports for construction / erection, receipt of equipment, monthly construction / erection plan, etc. The contractor shall also indicate resource deployment at site, highlights of critical areas and constraints in the site progress reports.

Other information related to site activities as may be required by the Purchaser / Consultant, shall also be submitted by the contractor. In the interest of timely completion of the project, the area of monitoring may be altered in consultation with the Purchaser/ Consultant, if required.

11.3.2 The Purchaser/Consultant shall also have the right to:

- Invite the Bidder for monthly /weekly/daily meetings to review the progress of the project.
- Depute Purchaser's authorized representatives for ascertaining / expediting progress at contractor's works.
- Suggest remedial actions to bridge-up time gap between planned progress & observed progress.

## **12 LIST OF DRAWINGS AND DOCUMENTS TO BE FURNISHED BY THE TENDERER**

### **12.1 List of drawings & documents to be furnished along with the offer**

The Tenderer shall submit the following drawings/ documents along with the offer: -

1. Duly filled in data sheets for various equipments as specified in the specification as well as various data of different equipments as offered.
2. Catalogues, literatures and GA drawings of equipments and valves.
3. Pipeline materials and specifications considered for various systems.
4. List of commissioning spares.
5. List of spares for operation and maintenance for the specified duration.
6. Tentative Bill of Quantities covering all equipments, valves, pipelines, etc. and associated civil, structural etc.
7. Other drawings and documents as listed in other chapters.

### **12.2 List of drawings and documents to be furnished after placement of order For Approval**

1. General arrangement and cross-sectional drawings, characteristics curves, Data sheets and technical details of all the equipments , valves and piping including GA drawings showing plan, elevation and sectional views of the piping system.
2. General arrangement and Layout of each unit like, pipe trestles, pipe networks.
3. Piping drawings indicating pipe routing, location of supports, valves and other fittings as required.
4. Test procedures for testing, pre-commissioning and commissioning.





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5. Quality Assurance Plan.

6. Test certificates for the following:

a) Material test certificate for all major equipment and their components, pipes, valves, fittings etc.

b) Hydraulic test of equipment, pipe fittings & valves.

c) Static and dynamic balancing of all rotary parts/ equipments

7. Other drawings as listed in various chapters

8. Any other drawing/ documents as required by the Purchaser.

#### **FOR REFERENCE AND RECORD**

The successful Tenderer shall submit required sets of all the approved drawings, documents and manuals for Purchaser's record and use. After erection of equipment, the Tenderer shall submit one set of in required number of prints along with soft copies in CD/ USB drive (in AutoCAD format) of each "As built drawings".

1. Operating and maintenance manual.

2. Recommended Spare parts list and price.

3. Instruction for erection and commissioning.

4. Manufacturer's test certificates.

5. Lubrication schedule and quantity and quality of lubricant for one year's normal operation.

6. Various equipment assembly drawings and bill of material.

7. Weld procedure.

8. Hydraulic test logs.

9. Equipment GA drawings and bill of materials.

10. Characteristics curves of the equipments.

11. Operation and maintenance manuals for all equipments, valves and complete water system along with soft copies.

12. Test and calibration certificates.

13. Warranty/ guarantee certificates.

14. Technical literature, catalogues and manufacturer's drawings for all brought out equipment, valves and other items.

15. All inspection/ test report/ certificates.