मुरगांव पत्तन प्राधिकरण
MORMUGAO PORT AUTHORITY
(पत्तन ,पोत परिवहन और जलमार्ग मंत्रालय, भारत सरकार)
(MINISTRY OF PORTS, SHIPPING & WATERWAYS , GOVT. OF INDIA)
यांत्रिकी इंजीनियरी विभाग
MECHANICAL ENGINEERING DEPARTMENT
प्रशासनिक कार्यालय, हेडलेण्ड-सडा, मुरगांव, गोवा. ४०३ ८०४
ADMINISTRATIVE OFFICE, HEADLAND SADA, MORMUGAO – GOA. 403804
Email ID: cme@mptgoa.gov.in

Ref. No.: CME/PD/I(6)/00113 Date: 12/01/2024

Sir,

Sub: **Budgetary offer for Engaging of Third Party Inspection Agency (TPI) for the Work of "Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority on turnkey basis"**

The tender for '**Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority on turnkey basis'** will be awarded shortly. The Port intends to engage a Third Party Inspection (TPI) agency while Port's Contractor carries out the work of Design, manufacture, supply, installation, Testing and commissioning, for the work of Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority(Project). TPI services shall be as per the Terms of References (TOR) enclosed at **Annexure-II** and for ensuring the compliance to the latest manufacturers standards and relevant IS or equivalent standards while execution of the Project in line with the Scope of work as enclosed at **Annexure-III**.

You are requested to submit a budgetary quotation for rendering the above TPI services in the Schedule of Quantities & Prices enclosed at the **Annexure-I**.

Executive Engineer (P&D)

Encl.: as above

ANNEXURE-I

Engaging of Third Party Inspection (TPI) Agency for the Work of "Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority on turnkey basis"

Sl. No.	Description of Work	Unit	Qty.	Amount Quoted (Rs.)	
				In Figures	In Words
1.	Charges for rendering the Third Party Inspection services for the work of "Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority on turnkey basis" as per ToR at Annexure-II attached herewith.	01	Lumpsum	Rs.	(Rupees_____ _____ _____ _____ _____only)

Note: Above quoted rates shall be inclusive of all taxes except GST which shall be paid extra as applicable.

BIDDER's SIGNATURE AND SEAL

ANNEXURE-II

Terms of References

NAME OF THE WORK:

ENGAGING OF THIRD PARTY INSPECTION (TPI) AGENCY FOR THE WORK OF AUGMENTATION OF FIREFIGHTING FACILITIES AT BERTH NO.8 OF MORMUGAO PORT AUTHORITY ON TURNKEY BASIS.

GENERAL CONDITIONS

1.0 GENERAL:

Mormugao Port Authority proposes to engage Third Party Inspection Agency while Port's Contractor carries out the work of Design, manufacture, supply, installation, Testing and commissioning, for the work of Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority(Project) on turnkey basis".

2.0 SCOPE OF WORK:

2.1 Third Party Inspection Agency shall ensure that the augmentation work indicated in the scope of work for the Project (**Annexure III**) is carried out as per the latest manufacturers standards and relevant IS or equivalent standards, OISD guidelines and ensure quality & workmanship.

2.2 Third Party Inspection Agency shall conduct any kind of inspection which may require regarding procurement, fabrication, installation, quality control, execution, commissioning and testing, during the span of the Project.

2.3 Every Drawings, Design data, Design Calculations, QAPs, Milestones/Bar Charts, document etc. as the case may be, submitted by the Contractor shall be vetted/approved by the consultant/TPI.

2.4 The Augmentation of Firefighting facility shall be carried out by adhering and complying with the latest guidelines of OISD and PESO requirements.

2.5 Third Party Inspection Agency shall supervise the works and services of manufacture, erection, installation, testing and commissioning of the project as specified in the scope of work of the Project in coordination with the Consultant appointed by MPA including inspection of spares and bought out items at manufacturer works and/or at site.

2.6 Inspection and testing of any of the components/item before dispatch to site shall be done by Third party Inspection agency to ensure that they conform to the tender specifications. Inspection and testing of any of the components before dispatch to site shall be done by the Third party Inspection agency in coordination with the consultant appointed by the Port for the project.

2.7 Stage wise Inspection of material supplied and received at site shall be carried out by the Third party inspection agency to ensure that all the items received at site conform to the tender specifications and are in good condition, for acceptance by MPA.

2.8 After application of each coat, DFT readings shall be measured and certified by TPI for acceptance by Port.

2.9 Entire Painting scheme including surface preparation shall be carried out in presence of representative of paint manufacturer and witnessed by TPI.

2.10 Certifying the completion of erection, testing and commissioning of firefighting facility and related scope of work including related civil works on successful commissioning of the system at Berth no. 8, for acceptance by MPA.

2.11 All necessary facilities like labour, materials, electricity, fuel, water, stores, apparatus, instruments, Test equipments, drawings, specifications, etc., for inspection whether in the premises of the Contractor or any Subcontractor or the supplier, will be arranged by the contractor, free of charge.

2.12 Ensuring submission of necessary test certificate and routine test certificate by contractor during every inspection. After successful inspection at factory, the TPI agency shall give the dispatch clearance.

2.13 After commissioning and handing over of the firefighting facilities, the final inspection report to be submitted.

2.14 The Terms of Reference is not exhaustive and is not to be taken as complete in details. The service of TPI agency should be complete in all respects as per Port's requirements and for successful implementation of the subject firefighting works.

2.15 The time specified to complete the firefighting work is 240 days from the date of LoA. TPI agency shall render the services until commissioning of the project.

2.16 The scope of work of tender for 'Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority on turnkey basis' is attached at **Annexure-III** for reference**.**

3.0 VALIDITY:

The price quoted by the firm shall hold good at least for 90 days from the date of opening of the quotation. The Board does not bind itself to accept claims for extra payments for items not included in the Quotation.

4.0 PAYMENT TERMS:

4.1 70% payment will be made through e-payment, after completion of inspection of all material/components at Manufacturer's works and MPA site and receipt of material/component in good condition at MPA site and conforming to the tender specifications, based on the certification of Third party Inspection agency in coordination with the consultant.

4.2 Balance 30% payment will be released on satisfactory completion of the Work of Augmentation of firefighting facilities at berth no.8 of Mormugao Port Authority by the Contractor, issue of Completion Report/Commissioning Certificate by the Third party Inspection agency in coordination with the consultant and acceptance by MPA.

5.0 <u>OTHER CONDITIONS</u>:

5.1 Scope of inspection shall be as per Technical Specifications, approved design, Engineering, drawings, As-built drawings, calculations, relevant standards, QAP, CPM charts, documents etc.

5.2 The offered rate should be inclusive of all taxes and duties including travel expenses, boarding & lodging, other incidental charges, etc.

5.3 GST will be paid extra as per the prevailing rules and regulations.

5.4 The gate entry pass for inspection shall be on chargeable basis as per SoR.

Note:

1. For any clarifications, the firm may contact Executive Engineer (P&D), Engineering Mechanical Department at 2nd floor, Administrative office building, Mormugao Port Authority, Telephone No. 0832-259 4227 / 4228.

ANNEXURE-III

TECHNICAL SPECIFICATIONS FOR THE WORK OF AUGMENTATION OF FIREFIGHTING FACILITIES AT BERTH NO.8 OF MORMUGAO PORT AUTHORITY ON TURNKEY BASIS

1.1 SCOPE OF WORK:

1.1.1 The Scope of work is not exhaustive and the Contractor shall undertake such other tasks as may be necessary to execute and complete the work of augmentation of firefighting facilities at MPA Berth No. 8 in all aspects, to make the firefighting system OISD-156 & 149 / PESO Compliant.

1.1.2 The firefighting system at berth no:8 of MPA was commissioned in 1996 with some repair/refurbishment/replacement works in 2018. However, there is severe corrosion of the structure and reduction in the efficiency of the equipment like pumps, engines, etc. MPA therefore intends to augment the firefighting facility for which Contractor shall carry out the Design, Engineering, Supply, Installation, Testing and Commissioning of the new system, to meet the latest edition of OISD-156/OISD-149/PESO guidelines & requirements. Accordingly, an indicative design layout drawings of fire hydrant and monitor system (FLS-E6-MPA-FHMS-PID-0001) and PI&D for fire water pump house (FLS-E6-MPA-FWPH-PID-0001) are attached herewith.

1.1.3 Before execution of the subject work, the Contractor shall obtain preliminary approval from PESO. After getting preliminary approval from PESO, the contractor accordingly shall carry out the detailed Design & Engineering of the system and submit the same for vetting/approval of Consultant/TPI. Contractor thereafter carryout the Supply, Installation, Testing and Commissioning and complete the said work of augmentation of the firefighting system under this contract in every respect in conformity with the approved documents and with the direction of and to the satisfaction of the Owner's site representative.

1.1.4 Vetting/approval of Design & Engineering of the system, by the consultant/TPI shall not absolve the Contractor of the responsibility of commissioning the facility strictly in accordance with the OISD guidelines, specification and drawings etc. and obtaining the PESO certificate.

1.1.5 The Contractor shall invariably supply all the quantities indicated in Bill of Quantities (BOQ) and any other additional required quantities of labour, materials and equipment as necessary which may not have been specifically mentioned herein or installed or noted in the tender Drawings/Documents as being furnished herewith, but which are necessary and customary to be performed under this contract, for satisfactory commissioning and operation of fire protection system as per the OISD guidelines, without any extra cost to MPA.

1.1.6 The amount quoted by the bidder in the price schedule shall also include any labour, material, equipment, appliances, and incidental work not specifically mentioned herein or installed or noted on the tender Drawings/Documents as being furnished, but which are necessary and customary to be performed under this contract, for satisfactory commissioning and operation of fire protection system. The Contractor should note that the entire job shall be carried out on turnkey basis i.e. the contractor shall carryout the Design, Engineering, supply, installation, testing and commissioning of firefighting facility including obtaining of PESO preliminary and final approval.

1.1.7 All the necessary accessories/equipment or any item not included in the scope of work but required for satisfactory commissioning and operation of fire protection system shall be

supplied by the Contractor without any extra cost to MPA and Contractor shall quote for the same accordingly in the price schedule. Such works, not listed in the schedule of works but elaborately described to perform or to facilitate particular operation(s) required for completion of the project shall be deemed to have been included in the scope of this tender and the Contractor shall supply, install the same without any extra cost, to MPA.

1.1.8 All civil works like drilling and punching holes and openings in concrete floors, slabs, chasing of brick walls, fabrication of supporting structures, drainage of water from cable trenches, cleaning and clearing of all debris due to Fire and electrical installation, including Excavation, scaffolding, back filling for direct burial of pipes as applicable, shall be considered while quoting for the tender as well as while preparation of execution drawings and as built drawing. Training of MPA Staff by the contractor shall be included in the scope of work.

1.1.9 Bidders are therefore required to visit the site and get themselves acquainted with the site installations and conditions before quoting.

1.1.10 Any part or whole of the system which require the approval of the PESO, or any other statutory body, should be arranged by the contractor at his own cost. All required Liaison work in relation to subject scope, including getting the PESO approvals shall be contractor's scope. All the certificates/licenses of the statutory authorities shall be however in the name of MPA. The total system shall be designed as per OISD (Oil Industry Safety Directorate) 156, 149 or other applicable guidelines of latest edition as per PESO requirements.

1.1.11 Contractor shall execute the subject work in coordination with the consultant, M/s FLS Engineering Consultants Pvt. Ltd., Thane, and the Third Party Inspection Agency, appointed by the Port.

1.1.12 Contractor shall execute the work of Augmentation of Fire Fighting Facilities at MPA Berth No. 8 including Mechanical, Civil and electrical works on Turnkey basis. The indicative Design and layout drawings of fire hydrant and monitor system (FLS-E6-MPA-FHMS-PID-0001) and PI&D for fire water pump house (FLS-E6-MPA-FWPH-PID-0001), prepared by the consultant is attached herewith for perusal.

1.1.13 The firefighting system at Berth no. 8 of MPA, shall be made PESO compliant, as per the OISD guidelines and requirements.

1.1.14 Submit every drawing, Design Data, design calculations, QAP's, Milestones/CPM charts, documents, etc. for vetting/approval of Consultant/TPI.

1.1.15 Contractor shall supervise the works in coordination with the consultant and the Third-Party Agency appointed by MPA. Following works of the firefighting system at Berth no.8 of MPA shall be carried out by the Contractor: -

(i) Design, Engineering, manufacture, procurement, inspection of spares and bought out items at manufacturer works and/or at site, supply to site.
(ii) Erection and installation
(iii) Testing and commissioning.

1.1.16 Contractor shall obtain necessary approvals on behalf of MPA from various Statutory Authorities that may be required for commissioning of firefighting system at Oil Berth no.8 of MPA as detailed below; but not limited to:

a. Chief Controller of Explosives, Nagpur, Petroleum and Explosives Safety Organization

(PESO)

b. Oil Industry Safety Directorate (OISD)

c. State Electricity Authority

d. Goa State Pollution Control Board, Panaji.

e. Fire NOC from Goa Fire Services, if required.

f. Any other approval from time to time

Any technical assistance and guidance to the Contractor, if required, may be taken from the consultant, for obtaining the above approvals by contractor from Statutory Authorities on behalf of MPA, as per the drawings and plans prepared by contractor and approved by Consultant.

Note: Final/Last payment due to the Contractor shall be made upon completion of all services and afte handing over the PESO Certificate for Berth no. 8 to MPA.

1.1.17 Before execution of work, the contractor shall obtain the preliminary approval from PESO for which contractor shall:

a. Submit Design of the firefighting system for vetting/approval of Consultant/TPI

b. Submit the approved design to PESO, for their approval

c. Obtain the preliminary approval from PESO and

d. Thereafter the contractor accordingly shall carryout Detailed Design & Engineering of the system and submit the same for vetting/approval of Consultant/TPI

Contractor shall thereafter carryout the Supply, Installation, Testing and Commissioning and complete the said work of augmentation of the firefighting system under this contract in every respect in conformity with the approved documents and with the direction of and to the satisfaction of the Owner's site representative. After completion of entire work, the contractor shall obtain the final approval/certificate from PESO for which contractor shall:

a. Submit as-built drawings of the firefighting system for vetting/approval of Consultant/TPI

b. Submit the approved drawings to PESO, for their approval and

c. Obtain the final approval/certificate from PESO.

1.1.18 All the final drawings, as-built drawings of the firefighting system at Berth no.8 of MPA shall be submitted with geographical co-ordinates, as these drawings are to be submitted to the BISAG team appointed by Ministry of Ports, Shipping and Waterways

1.1.19 The cost of all travel in connection with any presentation or site visits to be made at any place shall be borne by the contractor.

1.1.20 Contractor shall attend periodical review meetings between the consultant, TPI and MPA.

1.1.21 Contractor shall exercise necessary controls as directed by the MPA and submit reports that may be required by the financing agency/Govt. from time to time.

1.1.22 The Contractor shall coordinate, as and when required, with all parties like TPI, consultant, external agencies, if any etc. involved in the work to ensure smooth, timely and satisfactory

execution of the contract work of the project.

1.1.23 Seawater shall be used as the primary source of water supply for firefighting. All the relevant systems, sub-systems must be selected based on compatibility with service conditions. The water-based firefighting systems for the protection of the Berth No-8 shall comprise but not limited to the following components:

- Diesel Engine Operated pumps
- Electrically operated pumps
- Diesel Engine Foam pumps
- Foam proportionators
- MS Pipes with poly glass coating
- Duplex Gate valves
- Duplex Non return valves
- Expansion bellows
- Pressure Gauge
- Pressure Switch
- Ball Valves
- Foot Valves
- Flow meter
- Pressure relief valve
- Tower mount foam cum water monitor
- Ground monitor
- Double head hydrant valve
- Hose Box
- RRL Hose
- Hose reel drum
- Short branch pipe
- Motorise gate valves
- MVSS nozzles
- Spray nozzles
- Alarm valve
- SR Sprinklers
- DG Set with Panel
- Pressure Monitoring Station
- Rolling shutter
- QRHS Mooring System
- Fire alarm system
- Gas detection system
- CCTV system
- Electrical System

1.1.24 Contractor shall however, design his own system, provide any additional requirement as necessary which may have not been listed above but are required as per OISD guidelines to perform or to facilitate particular operation(s) required for completion of the project. The

Contractor shall supply, install the same without any extra cost, to MPA.

1.1.25 The fire pump house pumps and other equipment's were installed in the year 1996. However Tower Monitors, Hydrants, Jumbo curtain nozzle and connecting pipelines (discharge side) were replaced in the year 2018. The Project for augmentation of firefighting facilities at Berth No. 8 of MPA involves 'Design, Engineering, Supply, Installation, Testing and Commissioning of Firefighting facility at Berth No.8 of MPA to handle POL products, Edible Oil, Ammonia, Oil & Chemicals and to make the firefighting system OISD-156 & 149/PESO Compliant' (the "Project")

1.1.26 The design & Engineering scope of work in line with OISD 156 shall include the following but not limited to.

- Preparation of Design Basis report for fire water & foam system.
- Design and Preparation of fire protection, fire pumps and foam pumps PI & D drawings.
- Design and Preparation of Wiring diagrams for all electrical and communication systems
- Design and Preparation of civil foundation drawings for all pipe supports, pumps, hose boxes, monitors, steel towers.
- Design and Preparation of drawings for fire pump room
- Design and Preparation of drawings for Steel tower for tower monitors
- Design and Preparation of drawings for all electrical equipment's like DG set, Pump room lighting, external lighting.
- Design and Preparation of drawings for Fire alarm system for Berth and Pump house.
- Design and preparation of drawings for gas detection for unloading arm.
- Design and preparation of drawings for Diesel engine carbon emission monitoring station.
- Design and preparation of drawings for fire water pipelines pressure monitoring station
- Design and preparation of drawings for CTV system.
- Design and preparation of drawings for public address system.
- Design and preparation of drawings for Lan and telephone connectivity scheme between Pump house and MPA admin office.
- Design and Preparation of drawing for rolling shutter
- Design and Preparation of drawing for control room to indicate the remote-control panel, annunciator, CCTV monitoring screens, fire alarm panel.
- Design and preparation of QRMH system.
- Design and preparation of lighting arrestor.
- Design and preparation of water spray system for pump room
- Design and preparation of sprinkler system for pump room building
- Design and preparation of MVWSS for unloading arm.
- Preparation and submission of QAPs for all items as per BOQ.

1.1.27 <u>The works in brief are as follows.</u> (Specifications of the equipment provided below is indicative. Contractor shall design and supply the same or of higher capacity):

(1) Remove the existing firefighting equipment's like engines, motors, pumps, valves, associates' pipes, other accessories, monitors, cement lines, isolation valves, etc. as per site conditions. The equipment removed shall be handed over to Port by shifting to a designated location within a radius of about 3 kms from the site, as per instructions of the Port Engineer.

(2) Design and provide the hydrant system to cover the all areas of berth-08 and unloading

station area shall be provided with double headed hydrant points. Water for hydrant services shall be fed by laying separate pipe line by taking tapping from pump house discharge header.

(3) Provide the Remote operated tower water cum foam monitors with construction of 20Mtrs height steel tower to reach the throw to cover manifold area of the deck of the largest tanker and loading arm in the lightest condition at high tides at the jetty.

(4) Existing Jumbo curtain nozzles are 6 numbers at MPA Berth no-8, 2 out of 6 jumbo curtain nozzles which are near to the Unloading arms shall be re arranged and keep the rest of 4 Jumbo curtain nozzles as it is.

(5) Design and provide medium velocity water spray system for manifold area near unloading station. Tapping for the water spray system shall be taken from the new recommended hydrant service pipe line with new motorised valve for remote operation of the system and new field and remote operated control panel with required cables & glands shall be installed.

(6) Design and provide new sets of pumps set for the firefighting system of following configuration along with entire (suction & Discharge Service) pipe lines & Associated valves, fittings and supports.

a. 2 Nos. Main Diesel Engines and Diesel Engine Driven pumps, 660 M^3/hr @140 MWC

b. 1 No. Stand by Diesel Engine and Diesel Engine Driven pumps of 660 M^3/hr @ 140 MWC

(7) Design and provide new sets of jockey pump set for the firefighting system of following configuration along with new pump suction/discharge pipe lines & associated valves, fittings and supports.

a. 2 Nos. Electric Motor Driven pumps of 35 M^3/hr @140 MWC.

(8) Provide isolation valve at all the existing and new loop junction.

(9) Design and provide the pipe supports across the jetty area and provide corrosion resistant paint as per the painting scheme provided in the tender at clause no: 5.5.33 on all pipe support.

(10) Design and provide 1 no. new International Shore Fire Connection (ISFC) near unloading station area along with all accessories.

(11) Design and provide internal hydrant point along with hose box and hose reel at each floor of pump house building. Tapping for the wet riser shall be taken from the hydrant system fire water pipe line. Provide all hydrant valves with 2 nos. of single headed type-A hydrant valves on 4” stand post. Also, orifice plates shall be provided on each hydrant valve.

(12) Design and provide 2 nos. of water cum foam tower mount remote operated monitors. These towers shall be kept at minimum distance of 15 meter away from the hazardous area. Also minimum 2 hour rated fire proofing shall be provided on the tower structure.

(13) Design and provide 1 No. water cum foam manually operated ground monitor near to unloading station and at distance of 15 meter/as per the requirement of OISD guidelines. Tapping for this manually operated monitor shall be taken from the tower monitor pipe line.

(14) Paint all hose boxes with corrosion resistance epoxy paint as per the painting scheme provided in the tender at clause no: 5.5.33.

(15) Provide following minimum quantities of fire extinguisher near unloading station area as per

the requirement of OISD guidelines.

a. 4Nos. 9 kg DCP Extinguisher
b. 2Nos. 75 Kg Wheeled DCP Extinguisher

(16) Design and provide centralized hose station along with hoses.

(17) Provide following minimum number of nozzles at central hose station as per the requirement of OISD guidelines.

1. Jet nozzles with branch pipe as per IS:903 - 4 nos.
2. Fog nozzles pipe as per IS:952 - 4 nos.
3. Universal nozzles as per IS: 2171 - 4 no's
4. Foam branch pipe as per IS:952 - 4 nos.

The proposed quantity of nozzles at central hose station in the tender is a minimum requirement. However, bidder to design the system to meet the requirements of OISD-156/PESO.

(18) Provide following minimum accessories at central hose station at control room station as per the requirement of OISD guidelines.

a.	Sand Scoops	4 nos.
b.	Safety helmets	10 nos.
c.	Water curtain nozzles	2 nos.
d.	Stretcher	2 nos.
e.	First Aid Box	2 nos. (min)
f.	11 KVA rubber hand gloves	2 pairs
g.	Explosive meter	1 no.
h.	Fire Proximity suit	2 no.
i.	Resuscitator	2 nos.
j.	Electrical siren (3 km range)	1 no.
k.	Hand operated siren	1 no.(min)
l.	Water jet blanket	2 nos.
m.	Red/Green flags	1 set

n. Positive Pressure type self-contained breathing apparatus with spare cylinder - 2 nos.
o. Low temperature Gloves for handling LPG/ Cryogenic liquids/ gases - 4 nos.

(19) Design and provide addressable fire detection alarm system at berth no.8 and at pump house building. Design and provide at Unloading station area IR flame detector. Pump house building shall be provided with multi criteria detector as specified in tender. Also, audio visual indication for fire detection and alarm system shall be provided. Fire alarm panel shall be kept at control room.

(20) Design and provide fixed hydrocarbon leak gas detector near unloading station and drain pit area. Minimum 4 Nos. of the fixed hydrocarbon gas detector shall be provided at jetty. As berth is handling ammonia, minimum 2 nos. of toxic gas detector shall be provided near unloading station area. Also, audio visual alarm shall be provided for the gas detection. Gas detection panel shall be kept at control room.

(21) Design and provide manual call point (break glass type) at all the area of berth no.8 and pump house building. It shall be connected to fire detection system panel loop. Indicative

minimum quantity shall be as shown in the drawing.

(22) Provide adequate communication system like Public Address System.

(23) The existing field and remote operation control panel for GM-01 Ground Monitor and Jumbo curtain nozzles – 4 nos. shall be used.

(24) Design and provide Foam diesel pumps (Main and Standby) with 600 LPM capacity and foam lines, valves, cables & fittings, etc.

(25) Design and provide the Diesel operated Foam pumps with required pipelines, isolation valves, cables, fittings etc. to complete the job.

(26) Design and provide the Wireless bridge for LAN and Telephone connectivity for connecting the MPA head office building to firefighting pump house building, remotely.

(27) Design and provide the flame proof cabling, cable fittings, cables, and glands for all control panels.

(28) Design and provide CCTV system with the ATEX approved cameras- 3no's, with remote joystick at the control room, with required storage equipment's, large monitor, and cables as detailed in this tender, for easy monitoring of tower monitors during the fire emergencies.

(29) Control room shall be modified to clear sitting arrangement with provision of air conditioning and drinking water.

(30) Pump room shall be provided with clear ventilation, lighting, fire door and wide entry access as per the requirement of OISD guidelines.

(31) Design and provide new 100 kVA DG set and required synchronized panel for all fire equipment power.

(32) Design and provide the earthing system for all electrical panels, pumps, field power equipment etc.

(33) Design and provide MOV's, compatible with existing local and remote-control panel.

(34) Design and provide the priming tanks and associated piping with items.

(35) Design and provide the 1 no. lightening arrestor at pump house.

(36) Design and provide the required light fixture to get the required illuminations inside the pump room and along the berth as per OISD 149.

(37) Provide the all-MS ERW Heavy-duty pipes with internal Poly glass coated and painted as per clause no: 5.5.32.

(38) Design and provide Pressure monitoring stations at control room and pump room.

(39) Design and provide single operated Single/quadruple Arm Quick Release Mooring Hook System, as per the BOQ. The system shall have provision to operate from the control room

(40) Any other activity, installation require for making the facility PESO compliant.

Figure-1: Jumbo Nozzles, Tower Monitors and Ground Monitors locations

1.2 BASIC DATA FOR DESIGN:

Maximum Ship Size : 49999 DWT

No. of Berth : 1 No.

Length of Vessel : 190 M

No. of Unloading station : 1 no.

Product handled at Berth: POL Products (HSD (Class-B), Motor Sprit (Class-A), Aviation Fuel ATF (Class B), Furnace Oil (Class C), Anhydrous Ammonia, Liquid Chem & Palm Oil).

The specifications of existing equipment installed inside the pump house, is enclosed at ANNEXURE-IV.

2.0 TECHNICAL SPECIFICATIONS FOR FIRE FIGHTING FACILITIES: The specifications of the equipment provided below is indicative. However, as per the requirements of OISD-156/PESO, Contractor shall design and supply the same or of higher capacity, if required, at his own cost.

2.1 <u>MAIN FIRE WATER PUMPS:</u>

The contractor shall carry out design and supply suitable pumps of reputed make for fire protection service with specific drives, controls, and pump accessory items. It is the contractor's responsibility to obtain necessary approval for the pump and control. The

pumping equipment shall be installed as per OISD 156 norms, latest edition for the installation of End suction Fire Pumps. Also, all the Pumps inside shall be coated with corrosion protection coatings and Foot valves shall have Ceramic coating to avoid marine growth. The selected pump shall be capable of meeting the specifications.

Contractor shall design the system with operating philosophy for pump set as follows:

a) Within the pump house, there shall be two independent headers pumping water through the pump sets installed in the pump house.

b) One of these headers shall be dedicated to meet the firewater demands posed by the hydrant/jumbo water curtain systems, Spray nozzles, etc.

c) The other header shall exclusively cater to tower water cum Foam monitor demand.

d) Both the firewater headers shall be externally connected by normally closed gate valves.

e) These valves shall be operated only in the event of an emergency or to provide an alternative path of flow for water while a section of the system is under maintenance.

f) The Fire Fighting system shall be fed by (2) two jockey (pressure maintenance pump) of 35 m^3/hr to maintain a minimum pressure of 14 Kg/cm2.

g) 2 Nos. of Diesel-Driven main pumps & 1 No. Diesel Engine driven standby pump shall feed the water to both Tower Monitor Header Lines and Fire Hydrant / Spray lines.

h) Two numbers (pressure maintenance pump) Jockey pump shall also be driven by an electrical motor of suitable capacity.

i) Electrical driven Jockey pumps shall be started manually as well as automatically.

j) Stopping of jockey pumps shall occur automatically either due to restoration of system pressure sensed by pressure switches or due to operation of interlocking circuits provided within the local control panel, which operate when one of the major Diesel motors is driven pump sets comes into operation.

k) Stopping of the major pump sets shall only be done manually by operation of the respective stop push buttons.

l) NPSH (Net Positive Suction Head): Pumps shall be designed for maximum efficiency (The fire pumps will draw water from the OPEN SEA under suction lifts condition). Existing suction pipe length is 6 meters. Bidders to visit the site and carryout the assessment of required data.

m) Pump characteristics shall meet the requirement as per OISD 156 and the pump should be capable of discharging 150% of its rated discharge at a minimum of 65% of the rated head. The pump shall withstand the hydrostatic pressure test to 1.5 times the maximum design working pressure of the pump. Pump casing must withstand the hydrostatic test pressure for 5 minutes without evidence of rupture. The shutoff head shall not exceed 120% of rated head for horizontal centrifugal pumps.

n) All pumps with engine and motor to be mounted and aligned on a suitable foundation of suitable height from the ground. Necessary foundation bolts along with the heavy-duty vibration damper shall be provided.

o) All rotating parts to have suitable sheet metal guard.

p) 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.

q) Each pump shall be provided with a Nameplate indicating Delivery Head, Capacity, RPM, etc.

r) Independent priming tank of 2000 liters each shall be provided for each pump.

s) Subject to area classification Flame Proof materials to be selected. The Consumables, and accessories with in the pump house shall be of flameproof and suitable for gas group IIA/IIB.

t) Expansion bellow shall be provided for pumps suction side of each pump set.

u) The pump capacities and head provided in BOQ is tentative. Bidder to validate the same as per OISD guidelines and select the flow and head of the pumps based on hydraulic calculations. These design calculation shall be submitted to the consultant for approval. A document proof to be submitted.

2.2 SPECIFICATION OF FIRE WATER PUMPS (FOR SEA WATER APPLICATION ONLY)

Type	: End suction centrifugal type (ENGINE DRIVEN)
Quantity	: 3 Nos.
Delivery Pressure	: 14 Kg/cm^2
Capacity	: 660 cu. Mtrs. /hr @140 MWC
Medium	: Sea Water from Open Sea
Efficiency	: Designed for maximum Efficiency
Stage	: Multistage
Rating	: Continuous / Marine Duty.
Head	Duplex SS
Casing	Duplex SS
Impeller	Duplex SS
Impeller shaft	Duplex SS
Shaft sleeves	Duplex SS
Bearing bush:	Thordon
Sleeve, gland:	Duplex SS
Fasteners	SS316L
Coupling	MS Coupling Guard
Sole/Base Plate	Standard Base plate
Foundation Bolts	SS316L
Anti-vibration pads	Included

Suitable type pressure relief valve for the main pumps shall be provided.

2.3 ENGINE FOR MAIN WATER PUMPS – 3 Nos.

a) The engine should be turbo-charged, horizontal inline, water-cooled four-stroke, cold start, heavy-duty compression ignition engine.

b) The Diesel Engine shall be complete with battery charger panel complete with boost and trickle charging facility, auto-manual selector switch, two sets of Lead Acid Batteries, (Batteries to be of sufficient Ampere Hour shall be adequate for 10 consecutive starts without recharging with a cold engine under compression) & battery with stand.

c) The engine shall be provided with a 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 shall 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 shall be provided as necessary.

d) Stack Gas discharge lines shall be provided as per the guidelines of Goa State Pollution Control Board or Central Pollution Control Board, in consultation with MPA. Additional engine starting panel preferably wall mounted, comprising of Start Button, Stop Button, Ammeter and Battery Charging Indication with necessary piping & cables shall be provided at the pump room.

e) 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.

f) Once the main pump starts running the jockey pump should be in cut off mode.

g) M.S. fuel tank of size suitable for 6 Hours operation with all welded construction shall be designed and provided. The capacity of the tank of 6 mm thick shall be sufficient to allow the engine to run on full load for six hours continuously. The tank shall 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. Companion flanges to be provided for both suction & discharge port. Secondary container shall be provided to take care of any leakage/overflow.

h) Each main pump shall have manual, remote and local controls. Manual starting of Pumps will be from pump-house. Remote control operation of equipment/system shall be accomplished from control cabin. Local control for maintenance and testing purpose shall be accomplished from dedicated control panel installed near the corresponding drive motor/system. Control selector switches for selection of manual, Remote & Local controls for each drive motor/system shall be on control desk cabin.

2.4 ENGINE SPECIFICATIONS: -

Type	Diesel operated
B.H.P.	Suitable of pump performance Curve.
Diesel Engine MOC	Carbon Steel Casting

Fuel consumption per litre per HP-hr.	As per Manufacturer Recommendation
Engine efficiency	As per Manufacturer Recommendation
Capacity of fuel oil tank	For at least 6-hour continuous operation
Type of cooling	Water cooled
Working principle	4 Stroke
Governing type	Turbo charged after cooled
Battery capacity	180Ah @ 24V DC
Fuel System	Mechanical Inline

2.5 SPECIFICATION OF JOCKEY PUMPS (FOR SEA WATER APPLICATION ONLY) WITH MOTORS—2 Nos.

Type	: End suction centrifugal type (MOTOR DRIVEN)
Motor Type	: 3-phase squirrel cage motor TEFC class F insulated and IE2
Motor Protection	: IP 55 and above
Quantity	: 2 Nos.
RPM	: Motor Shall be Suitable KW Rating @ 2900 Rpm
Type	: 3-phase squirrel cage motor TEFC class F insulated and IE2
Insulation	: Class – F
Operating Voltage	: 415 V AC Supply
Frequency	: 50 Hz
Protection	: IP55, TEFC
Rating	: Continuous
Delivery Pressure	: 14 Kg/cm^2
Capacity	: 35 m^3/hr @140 MWC
Medium	: Sea Water from Open Sea
Efficiency	: Designed for maximum Efficiency
Stage	: Single /multi stage
Rating	: Continuous / Marine Duty.
Head	Duplex SS
Casing	Duplex SS
Impeller	Duplex SS
Impeller shaft	Duplex SS
Shaft sleeves	Duplex SS
Wearing ring	Duplex SS
Bearing bush:	Thordon

Fasteners	SS316L
Coupling	MS Coupling Guard
Sole/Base Plate	Standard Base plate
Foundation Bolts	SS316L
Anti vibration pads	Included

2.6 ASSOCIATED PIPING

i) The new Hydrant line pipes shall be M S ERW Heavy (Class C) Pipe as per IS:1239 Part-1 for 150mm dia. and below & IS:3589 Gr. Fe. 410 for 200 mm dia. and above with internal Poly-Glass coating of 1000 micron for carrying seawater which used in the system and shall be as mentioned in Bill of Quantities. The Contractors shall provide the required pipe support, specials reducers, expanders, puddle pipe, fittings, flanges, gaskets, nuts and bolts etc. Fabrication and inspection of pipelines shall be in accordance with following codes: BIS-9595, 814, 822, 4853 and 3703. Doubler plates for piping supports shall be provided by contractor for running the main firefighting pipelines on approach trestle. The contractor as required at his cost 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.

ii) All pipes shall have flanged joints for connecting to each other. All such flanges shall be welded on to the pipes before the application of internal Poly glass coating. Any damage noticed on the poly glass coating before installation shall be made good by the contractor at his own cost.

iii) All pipelines shall be supported by providing steel/R.C.C. with clamps fittings and fixtures.

iv) All pipes carrying foam compound shall be of stainless steel 316 grades and of suitable schedule and should be hydrostatically tested to 1.5 times of operating pressure and proof of testing to be submitted to MPA.

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

vi) Pipe –water flow calculation to be furnished by the contractor.

vii) Requirement of main pipeline given in Bill of Quantities.

2.7 REMOTE CONTROLED TOWER MOUNTED MONITORS.

a) Long Range Water cum Foam Tower Monitors in SS316 construction UL Listed shall be Tower Mounted with fixtures, clamps, SS Fasteners etc. The Long Range water cum foam monitor shall be suitable to discharge 3000 LPM of water at a horizontal range of 70 m and vertical range 30-40 m and 3000 LPM foam water solution with a horizontal throw range of 65 m and vertical range 30-40m. The existing system is of 3000 lpm capacity. However, as per the requirements of OISD-156/PESO, if it is required to design the system for more than 3000 lpm, then the bidder shall design and provide the same, at his own cost. The electrical/electro-hydraulic equipment's for horizontal and vertical rotation, with base

operation control. The operation of the tower monitor shall be remote-controlled, electrically operated from the control tower as well as from the Local flameproof Control panel.

b) MOC of Nozzle, Body, Elbow, Bend, Flange, shall be SS316. The Monitor shall be suitable to install on structural platform at height of 20 mtr. All electrical components shall be flameproof type, suitable for gas group IIA/IIB.

c) The monitor shall be suitable for both foam and sea water. Each tower monitor shall be capable of discharging 3000 LPM of expanded foam and 3000 LPM of sea water at 7 kg/cm^2 inlet pressure. The existing system is of 3000 lpm capacity. However, as per the requirements of OISD-156/PESO, if it is required to design the system for more than 3000 lpm, then the bidder shall design and provide the same, at his own cost. The inlet Pressure of 7Kg/cm^2 is indicative only. It is the responsibility of the contractor to select a suitable monitor to ensure throw of 70 mtrs. from tower using the main pump specified. All the monitors shall be capable of discharging foam solution of AFFF 6% concentrate low expansion foam.

d) The materials and specifications used for different parts of the monitor shall be as under:

i. Barrel, Body – SS316

ii. Bronze worm and Worm Wheel shall be used for vertical and horizontal rotation of monitor.

iii. Horizontal and Vertical Swivel incorporating ball bearings- SS316.

iv. Column- Water/Foam solution Branch pipe-SS 316.

v. Bolts, Nuts & Washers- SS316.

vi. Electric Motors- IP 65 and above, Flame /Explosion proof and 415 Volt of 0.5 HP rating.

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

e) The Monitor shall be capable of 340° rotation in either direction in horizontal plane and 90° (elevation) and 45° (depression) in vertical plane. Suitable electrohydraulic 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 terminal control building. The contractor should include one hydraulic / electrical operating station at the base of each Tower which can be used manually in case of failure of remote control from control building. The monitor assembly shall be designed to resist the nozzle reaction force experienced during the operation of the monitor. The monitors shall be provided with a changeover valve of suitable design for instantaneous switch over from foam to water or vice versa. The entire assembly shall be tested to an internal hydraulic pressure of 20 kg/cm^2. A suitable pressure gauge shall be provided to the inlet connection of the monitors at the top of tower and on platform. The Tower monitor shall be of Jet & Fog type.

f) **Other accessories / Equipment's which shall be provided are: -**

i) Pressure Gauges at the bottom of the monitor and further at the remotest point from the jetty.

ii) Directional double acting spool type valve with 7kg/cm^2 maximum operating pressure.

iii) Relief valve at 7kg/ cm^2.

iv) Power pack tubing of copper/SS.

v) 10 mm male hydraulic connection with 6 nos. 10 x 1 M long, Teflon tube with SS braid, tested at 70kg/cm^2.

vi) Motor electric driven flameproof type.

vii) Design and working drawings for civil works and Quality assurance plan for the same shall be submitted for approval.

g) **Remote Control Station for Tower Monitor:**

Remote Electric Control Station shall be indoor type, desktop control for operation of two monitors with steel enclosure complete and shall have following control features.

i) Joystick for each tower monitor for up/down, left/right movement

ii) One push button per monitor for nozzle jet/fog.

iii) Red light indicator (one indicator per monitor) to show hydraulic oil pump control circuit is energized.

iv) Power On indicator.

v) Operating voltage - 24V DC for control units.

vi) 3 phase 0.75 HP for hydraulic pump drive.

vii) Foam pump on/off switch with running light indication.

viii) Electrical Fire-Resistant Ar. cabling.

ix) Hydraulic oil supply is in scope of contractor.

x) Monitor manual override provided from monitor itself.

xi) Adequate Lines of tubing for interconnection from the monitor to hydraulic power pack to be supplied, (i.e., if kept more than 1.5 meter away from the monitor)

xii) If power pack is mounted on the tower, then no tubing is required at the base of the Monitor.

xiii) Main control panel is to be installed in Control room in safe area.

xiv) Remote control with joystick shall be provided for rotation of foam/water monitors in horizontal and vertical planes.

xv) The remote-control panel in the control room shall have the necessary controls for operations.

2.8 SPECIFICATION OF TOWER MOUNTED MONITORS

Capacity:	3000 LPM Suitable for foam as well as water
Body:	SS316
Barrel:	SS316
Worm & Worm wheel:	SS316
Swivels:	SS316
Base flange:	SS316
Bolts & nuts:	SS316
Maximum horizontal rotation:	340^0
Maximum vertical rotation:	+90 Degrees and -45 Degrees
horizontal throw:	Water-70Mtrs Water with Foam-65Mtrs
vertical throw:	Water: 30-40Mtrs Water with Foam: 30-40Mtrs
Design pressure	$7Kg/cm^2$
Operation type	Manual and remote operated from local control panel and field control panel
Approvals	UL Listed
Accessories	Electrical /electro hydraulic equipment's for horizontal and vertical rotation.

2.9 TOWER MONITOR STEEL STRUCTURE

Contractor shall Design, SITC of 20Mtrs height MS Tower Structure for Tower Monitor TW-1 & 2 with access Ladders (Ladder shall be staircase type) including civil foundation works as per site conditions. The existing system is of 20 mtr. height. However, as per the requirements of OISD-156/PESO, if it is required to design the system for more than 20 mtr., then the bidder shall design and provide the same, at his own cost. The tower shall be applied with fire paint UL listed for 2hr fire rating for entire height of 20 mtrs. or more. The civil work shall also include works like excavation, back filling, foundation works etc. and operating platform, staircase with hand rail. Contactor to furnish the foundation drawings for prior approval. The Tower Structure for Tower Monitor assembly shall be designed to resist the nozzle reaction force experienced during the operation of the monitor.

2.10 DOUBLE/SINGLE HEADED HYDRANT VALVE

Type : Oblique type `A' SS316
Size : Inlet 80 mm dia flanged and outlet 63 mm Dia. female inst. coupling with spring lock type.
Standard : IS-5290 mark

End Connection : Flanged, Drilling As per ANSI B16.5 150#
Flow test : 900 lpm

2.11 HOSE PIPE

Standard : IS: 636, Type 3

Size :63 mm.

Standard Hose length :15 Mtr.

Material of Construction : Synthetic Nitrile rubber lining on high tenacity synthetic yarn

Type :RRL – Reinforced Rubber lining.

Performance required

Burst pressure : 35.7 Kg/cm^2

Working Pressure :17 Kg/cm^2

Proof pressure :25 Kg/cm^2

Finish :Red

End Fitting :Pair of male female coupling- quick coupling end, spring lock pull type.

Coupling

Standard	:	IS 903
Type	:	Instantaneous
Size	:	63 mm

Material

Hose Coupling	:	SS 316 IS 3444 Gr.4
Spring	:	SS 316 IS: 6528
Washer	:	Rubber IS 937
Hydraulic Test pressure	:	21 Kg/cm^2 for 2.5 min.
Finish	:	Polished
Approval	:	ISI mark

2.12 HOSE BOX

a) External Hose Box Specification:

Fabricated out of FRP Body, 5mm thick & Door with 3mm thick. Front Glass, (3 mm thick glass with rubber beading) door and size of cabinet shall be 900 mm x 750mm x 250mm, quoted rate shall include suitable stand for mounting, fasteners, Lock, Key, hammer etc. Hose Box shall be suitably marked on the outside with the letters "FIRE HOSE" including necessary locking arrangement

Material of Construction	:	Fabricated out of FRP Body, 5mm thick & Door with 3mm thk. Front Glass
Mounting	:	Pedestal mounted
Size (L, B, H)	:	900 x 750 x 250 mm
Body & Door	:	FRP
Glass	:	3mm thick
Contents	:	2 nos. 15 Mtr. Long 63 mm size hose with 1 no. Branch pipe
Painting	:	As per OISD-156

b) Internal Hose Box Specification:

Fabricated out of FRP Body, 5mm thick & Door with 3mm thick. Front Glass, (3 mm thick glass with rubber beading) door and size of cabinet shall be 700 mm x 600mm x 250mm, quoted rate shall include suitable stand for mounting, fasteners, Lock, Key, hammer etc. Hose Box shall be suitably marked on the outside with the letters "FIRE HOSE" including necessary locking arrangement

Material of Construction	:	Fabricated out of FRP Body, 5mm thick & Door with 3mm thk. Front Glass
Mounting	:	Pedestal mounted
Size (L, B, H)	:	700 x 600 x 250 mm
Body & Door	:	FRP
Glass	:	3 mm thick
Contents	:	2 nos. 15 Mtr. Long 63 mm size hose with 1 no. branch pipe
Painting	:	As per OISD-156

2.13 CO_2 FIRE EXTINGUISHER

IS Specification	: IS: 2878/15683 & capacity 2 to 22.5 kg
Type	: High Pressure type
Construction	: Cylinder bearing IS: 7285 and brass forged valve IS:3224
Charge	: CO_2 confirming to IS: 15683 & filled with liquefied CO_2 **gas** filling with ratio <=0.667
Accessories	: Wall mounting brackets.
Finish & Painting	: P. O. red as per mfg. & painting specification given with this document
Approval	: Approved and certified by BIS

2.14 DCP FIRE EXTINGUISHER

IS Specification	:	IS: 2171/15683 and capacity 6 & 9 kg
Construction	:	Body Mild steel
Cap	:	Brass forging
Charge	:	MAP -90%
Accessories	:	Wall mounting brackets.
Finish & Painting	:	As per Manufacturer standard
Approval	:	Approved and certified by BIS
Certificate of filling date)	:	Required (not more than 15 days older than commissioning

2.15 TROLLEY MOUNTED TYPE DCP FIRE EXTINGUISHERS

IS Specification	:	IS: 10658 - 1999
Charge	:	MAP-90%
Body	:	MS sheet as per IS:2062
Finish & Painting	:	P. O. red as per mfg.

2.16 PRESSURE SWITCHES

Type of mounting	:	Direct mounting on pipe

Sensing element	:	SS 316 Bellows with SS 316 Wetted parts
Enclosure	:	Die cast aluminium Enclosure weatherproof to IP: 66
Switch type	:	1 SPDP /10A Res 4A ind. 380VAC, 12W 220VDC
No of Contacts	:	1 No. NO/ NC
Pressure setting	:	To done at site as per approved P & I
Max test pressure	:	30 Kg /cm^2
Range	:	0- 20 Kg/cm^2 each switch.
Differential range	:	0.3 to 2 Kg/cm^2
Max process temp	:	170 deg. C
Max amp Temp	:	70 deg. C
Material	:	316
Connection	:	Threaded 1/4" BSP (M)
Cable connection	:	1/2"NPT (F)
Accessory	:	Snubber SS316
Accuracy	:	+ or – 1% FSD (Full scale deflection)

2.17 FOAM SYSTEM

A. General

SS-316L **Inline Balance Pressure Foam Proportionating System** consisting of proportioner, spool valves, foam concentrate valve, drain cock valves, duplex gauge, pressure gauge, check valves at foam concentrate inlet, water & foam sensing line, automatic concentrate control valve with flush connection complete in all respect and suitable for outdoor installation shall be supplied. (Capable for Flow Max - 11000 LPM with 0.5 max. bar pressure drop)

B. Jetty Foam System

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

ii) The pumps shall obtain foam under positive suction from the existing foam concentrate tank located in pump house.

iii) The foam concentrate pumps (main and standby) shall be Diesel Driven. The running light indication of the pumps must be available at the Control Room.

iv) The foam tank shall have a suitable vent connection.

v) It shall have all the relevant instruments such as level gauge, high- and low-level alarms level switch, provision for dip stick, inlet, outlet, recirculation and drain connections, as per requirements.

vi) 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.

vii) The main MOV's (Motor Operated Valve) should be normally kept close.

viii) Control for the MOV's at berth should be available at the Tower Monitor Control Rooms.

ix) Starting of foam pumps should be able to be initiated by operation of push button systems located next to the pumps installed.

x) Stopping of the foam pump sets shall be done manually only from the local control panel.

xi) Mixing of foam and water in the required proportion shall be achieved through the ratio controllers located in inline induction system. Flow indicators must be installed in the system to monitor the quantity of foam fed into the system.

C. Foam Supply Pumps:

2 nos. Diesel Engine driven foam pumps (One in operation and One Stand by) shall be used to pump foam compound to the proportioner system for tower monitors for injecting 6% AFFF of foam in main water lines Specifications of foam pumps and foam lines are described below.

D. FOAM PUMP GEAR OPERATED SPECIFICATIONS: -

Pump type	Diesel Engine Driven Gear Operated
Quantity	2 nos. (1 no. Main and 1 no. Standby)
Liquid handled	AFFF Foam
Rated discharge	600 LPM
Discharge pressure	16 kg/cm^2
Casing and covers	SS316.
Rotor and stator shafts	SS316.
Rotor and stator gears	SS316.
Base plate	SS 316

E. Foam Supply Tank:

Existing 2 Nos. Foam supply tanks shall be used to supply the foam to tower monitors.

F. PROPORTIONER SPECIFICATIONS: -

Application	Foam Concentrate AR FFF 6% or A FFF 6%
Quantity	1 no.
Maximum flow	11000 LPM

Minimum pressure	7 Kg/cm^2
Maximum pressure	14 Kg/cm^2
End connection	Suitable for Flanged 150# ANSI B 16.5 RF
Foam inlet connection	Female NPT Threaded
Upstream and Downstream connection	Flanged 150# ANSI B 16.5 RF
Material of construction	
a) Spool valve	SS-316L
b) Spool valve piston	SS-316L
c) Proportioned body	SS-316L
d) Non return valve	SS-316L
e) Foam concentrate valve	SS-316L
Anti-Vibration Pad	Included

G. ENGINE SPECIFICATIONS

Type	Diesel operated
Quantity	2 nos. (1 no. Main and 1 no. Standby)
B.H.P.	Suitable for pump performance Curve.
Engine efficiency	As per Manufacture recommendation
Capacity of fuel oil tank	For at least 6-hour continuous operation
Type of cooling	Radiator cooled/ As per Manufacturer recommendations
Battery volts	24V DC

H. Valves General

i) All the valves shall be designed, manufactured and tested as per the Indian Standards/ British Standards.

ii) All the flanged valves, irrespective of their pressure rating, shall have flanges to be drilled as per IS: 6392 - 1971 (RA 1993) (IS: Table 17).

iii) All valves shall be so designed that the effort/ Torque required to operate the valve is minimum.

iv) All valves shall be designed for 100% tight shut off condition.

v) All the valves shall be provided with hand wheel. The face of the wheel shall be clearly marked with the words "Open" and "Close" and an arrow to indicate the direction for opening/closing.

vi) All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be as per ASTM A 193 Gr. B7/194 Gr.2H.

vii) All the flanged valves shall be supplied with companion flanges of MS plates conforming to IS: 2062 and drilled to IS: 6392. – 1971 (RA 1993) Table 17, CAF gaskets conforming to IS: 2712 -1979 (RA 1994) and Black bolts and nuts conforming to IS: 1363-199.

viii) For all the Ni-cast iron valves body shall be so designed that at duty point, wall thickness is greater than the minimum specified in the various standards. Particular attention should be given to the distribution of material to limit the stresses within permissible range and to prevent stress concentration anywhere in the valve design.

2.18 GLOBE VALVE

i) Globe valves shall be designed as per ASTM A 216 Gr. MOC Gun metal. All the valves shall be fitted with loose disc, which can revolve freely around the stem to avoid falling on the seat at the point of closure. Stem shall be of one-piece design, heat treated, and ground finished to a high accuracy to avoid scoring and to ensure smooth movement in stuffing box.

ii) Gun Metal Non-Rising Spindle Type Globe Valve shall have G.M. Spindle, manually Hand wheel operated Conforming to IS: 778. BSP Female Screwed ends. The Valve Hydro tested to 24 Kg/Cm^2 for Body & 16 Kg/Cm^2 for Seat.

2.19 GATE VALVES

All the gate valves 200mm and above shall have mechanical position indicator with adjustable position stopper and lock to prevent over travel.

MOC : Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) 316

Type : Double Flanged Rising Spindle OS&Y Type Gate Valve having S.S. AISI Duplex SS Spindle,

Packing type : Gland Packing

Ring : Graphite Ring,

Operation Type : Manually C.I. Hand wheel operated Conforming to API Standards.

Flange ends : Drilled to ASME B-16.5 Class-150 R/F.

Testing : Valve Hydro tested to 24 Kg/Cm^2 for Body & 16 Kg/Cm^2 for Seat.

All the isolation valves mentioned above shall be manufactured from forgings.

2.20 BUTTERFLY VALVES

All the butterfly valves (200 and above) shall be gear operated type & of approved make. The butterfly valves shall be conforming to BS: 5155. The material composition of the various components of the valves shall be as under: -

Body	:	Cast Carbon steel ASTM A216 Gr. WCB
Disc	:	AISI-316.
Spindles	:	SSAISI-410.
Retainer Ring/ Seat Ring	:	SSAISI 410
Disc Seal	:	Nitrile Rubber
Bearing Bush	:	Bronze
Body Seat	:	Nitrile Rubber
Gasket	:	CAF
Nuts and Bolts	:	SS316

2.21 NON-RETURN VALVE

i) All the NRV in water line shall be of approved make and conforming to class 150. The material composition of the various components of the valve shall be as under:

Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Swing Type **Non-Return Valve** having Duplex Stainless Steel Hinge Pin, **Conforming to BS: 1868.** Flange ends drilled **ASME B-16.5 Class-150.**

ii) **SPECIFICATIONS OF NON RETURN VALVE:**

Class of valve	PN 16
Type	Duplex Stainless Steel (ASTM A890 GR. 5A- E3MN)
Code/Standards	ASME
Rating	Confirming to BS: 1868.
Hydrostatic test pressure kg/cm²	
a) Body	24 Kg/cm^2
b) Seat	16 Kg/cm^2
End connection	ASME B-16.5 Class-150 R/F
Material of construction	
a) Body	Duplex Stainless Steel
b) Disc	Duplex Stainless Steel
c) Spindles	Duplex Stainless Steel
f) Gasket	metallic with SS316 spiral wounded CAF filler
g) Nuts and Bolts	SS316

2.22 GROUND MONITOR-MANUAL OPERATED.

Manually Operated Ground Monitor, High-volume long-range Monitor with Self inducting Nozzle, SS316, UL LISTED. Variable flow 500 GPM, capacity at 7 bar, having 6" NB flanged ANSI B 16.5 #150 SORF, inlet and geared swivel joints with self-locking arrangement, permitting from 360° Horizontal Rotation and + 90° Vertical to - 45° vertical traverse. Self-inducting Aqua foam nozzle SS 316 with 3-4 meter long pick up tube with Strainer. 500 GPM of water at horizontal range of 60 m and vertical range 30 m or 500 GPM foam & water mixture with a horizontal throw range of 55m and vertical range 25m at 7 bar in still air condition.

2.23 FOOT VALVE

Foot valves shall be installed below the sea water as per pumps PID. The foot valves shall be of Flange end type with internal ceramic coating, Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN), Lift type Foot Valve having Rubber Molded Disc Seat for 100% leak proof design with SS Strainer, Conforming to IS: 4038 P.N.0.2. Flange ends drilled to ANSI B 16.5. The Valve Hydro tested to 06 Kg/Cm^2 for Body & 02 Kg/Cm^2 for Seat. Existing suction depth shall be maintained.

2.24 MOTORISED GATE VALVES

i) SS Super Duplex Gate Valve SS with Rising Spindle, as per API Standards with flange end connection as per ANSI B 16.5 150 # and Nut and Bolt as per ASTM A 193 Gr.B8M.The valve shall be tested as per API Standards. MOC of valve Body, cover & bonnet shall be as per A890GR.F5A, Trim, Body seat, disc shall be UNS J93404.

ii) MOV With Operating Voltage of 415 V AC 50 HZ and flameproof Enclosure with zone IIA/ II B application and 3-phase squirrel cage motor, TEFC class F insulated (temperature rise limited to class B) both for motor and its terminal box, for outdoor duty. The motor shall be provided with anti-condensation heater.

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

iv) The motor shall be flameproof 3-phase squirrel cage TEFC class F insulated (temperature rise limited to class B) IP 67 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.

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

vi) 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.

vii) 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.

viii) 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 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 and above 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.

ix) The actuator shall be suitable for operation at specified ambient temperature. All actuators 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.

x) The actuators shall be operated both from the control cabin as well as by manual for testing and maintenance purpose. Isolator along with starter for the actuator motor shall be located.

2.25 SPECIFICATIONS FOR MOTORISED GATE VALVE

Class of valve	PN 16
Type	Duplex Stainless Steel (ASTM A890 GR. 5A- E3MN)
Code/Standards	ASME
Rating	Confirming to API Standards.
Hydrostatic test pressure	
a) Body	24 Kg/cm^2
b) Seat	16 Kg/cm^2
End connection	ASME B-16.5 Class-150
Electrical Actuator details	
a) Enclosure Type	Flameproof
b) Degree of Protection	Tropical grade PVC insulated
Motors	

a) Type of Motor	3-phase squirrel cage motor TEFC class F insulated
b) Type of Mounting	Hand Wheel
c) Motor Rating	Operating Voltage of 415 V AC 50 HZ and flameproof Enclosure with zone IIA/ II B application
Material of construction	
a) Body	Duplex Stainless Steel
b) Disc	Duplex Stainless Steel
c) Spindles	Duplex Stainless Steel
f) Gasket	metallic with SS316 spiral wounded CAF filler
g) Nuts and Bolts	SS316L

2.26 PRESSURE GAUGES

Design and Construction Requirement

a) Service : Saltwater / foam
b) Dial size : 150 mm diameter Glycerin filled
c) Mounting : Direct
d) Accuracy : 1%
e) Over range protection : 25% above maximum line pressure
f) Sensing filament : Bourdon
g) Scale Range : 0-25 kg/cm^2
h) Connection : Bottom connection with ½" NPT (M) Threads.
i) Weather Protection : IP-54 as per IS 2147 or higher
j) Material of Construction Housing : Die cast Aluminum
k) Pressure element and shank movement : SS – 316
l) Gauges should be shock resistance type.
m) Manufacturer's test certificate shall be furnished for the following:
- Calibration in ascending and descending order at 0, 25, 75 and 100% of the range of the pressure gauge.
- Over range protection test.

2.27 CONTROL PANELS

a) It shall be flame proof (outdoor application), dust and vermin proof, wall mounting type with equipment mounted on a base plate inside, behind a hinged lockable front door.

b) All components to be complete wired unto terminal block with at least 20% spare terminals and provided with earthing terminals.

c) The degree of Protection for enclosure shall be IP - 55 for indoor type and IP65 and above for outdoor duty. Outdoor control panels shall be provided with canopy to avoid damage during rain.

d) START Push Button shall be shrouded type in green color with 1 NO + 1 NC contacts (minimum) or as per final circuit diagram.

e) STOP – Push Button shall be red color and Press to lock and turn to release type.

f) Name plates with drive description, mechanism number and functional requirement shall be provided.

g) For non-reversible drive, 2 pin Push Button switch (START & STOP) in control panel shall be provided.

h) For reversible drive, 3-pin Push Button switch (FOR-REV-STOP) in control panel shall be provided.

2.28 JUNCTION BOXES

The junction boxes shall be dust and vermin proof and made of pressed sheet steel having minimum thickness of 3mm with rubber gasket at all joints and openings. The JB will contain suitable type and number of terminals including 20% spare terminals for terminating cables. Junction box shall be flame proof and weatherproof and suitable for group IIA/IIB.

2.29 POWER AND CONTROL CABLES

a) For 415V/440 V power supply services, and motor feeder, space heating, outdoor lighting in the jetty and allied structures, the cables, power supply etc. shall be 1100 volt grade, multi core, standard Copper conductor (grade H4, class 2 as per IS: 8130 of 1976), extruded PVC compound type A insulated, cores laid up, inner sheathed with galvanized steel wire or strip armored for multicore cables outer sheathed with extruded FRLS PVC compound complying with IS: 1554-Part I of 988 as amended up to date. For 415 V for motors feeder XLPE insulated sheathed Aluminum cables shall conform to IS 7098.

b) 1.1 KV PVC, (FRLS) Copper Control Cables for control, protection, CT/PT connections, interlocks, metering, solenoids etc. control cables with the following specifications shall be provided.

c) 1100 volt grade, multi core, stranded, annealed, high conductivity copper conductor (class 2 as per IS: 8130 of 1976), extruded PVC compound insulated, cores identified by numerals, cores laid up, inner sheathed with extruded FRLS PVC compound, armored with galvanized steel wire/strip and outer sheathed with complying with IS: 1554 Part I of 1988 as amended up to date.

d) **Design Criteria for cable sizing**.

i) Minimum cable size for LT power cables shall be 6 sq. mm Copper. The minimum size of control and lighting wires shall be 2.5 sq. mm. Copper.

ii) Current carrying capacity.

e) The cable shall carry the full load current of the circuit and rated full load current of the motor under the specified ambient temperature and other conditions of installations full load current of the circuit shall not exceed the 80% of rated current carrying capacity of the cable to be designed and selected considering voltage drop within permissible limit of 5%. For this suitable derating factors for laying conditions as listed below shall be considered based on the manufacturer's recommendation.

i) Ambient ground / Air temperature

ii) Depth of laying and condition of laying
iii) Grouping of Cables
iv) Other applicable site requirements.

f) **Short circuit rating:**

i) The cables for circuit breaker-controlled feeders shall withstand the short circuit current for the specified time.

ii) For circuits, which are protected by fuses, cables need not be sized to withstand the short circuit.

g) **Permissible voltage dip/drop**

The voltage drop in cables from main 440V switchgear to the connected 440V motor shall be limited to 5% at motor terminals. Further, the total voltage drops in cables from main 440V switchgear to MCC and from the MCC to the motor terminals and other consumers including lighting fittings shall be limited to 5%. Voltage dip during starting of any individual motor shall be limited to 15%.

Sequential length marking at every meter shall be provided in outer sheath of all cables (Power, control, Instrumentation). ISI marking at every meter of cable length shall be provided. Core of multi-core control cables shall be serially numbered at every 75 mm.

h) **Cable Installation inside the control tower**

1) All cables irrespective of type of installation shall be protected by means of G.I. pipe (B class) or sheet metal protective cover up to a height of 2000 mm from the working floor level and platform for protection against mechanical damage.

2) Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in run shall be well defined and made with due consideration to avoid sharp bending of cables. The bending radius of various types of Multi - core cables shall be as per manufacturer recommendations.

3) No joint shall normally be made at any intermediate point in through runs of cables unless the length of the run is more than the length of standard cable drum. In case where jointing is unavoidable the same shall be made, after the approval of MPA by means of standard cable jointing kits.

4) Supporting brackets for trays shall be provided at an interval not exceeding 1500 mm. Vertical spacing between trays shall generally be 300 mm. Where there is a possibility of mechanical damage cable trays shall be adequately protected by sheet steel covers. For future requirement of laying additional cables adequate tray / spare shall be provided in the trays.

5) All cables shall be provided with identification tags indicating cables numbers in accordance with cable/circuit schedule. Tags shall be fixed at both ends of cables, at joints, and at 20m spacing for straight runs. When a cable passes through a wall, tags shall be fixed on both sides of the wall. The tags shall be of aluminum sheet (non-ferrous materials for single core cables) with number punched on them and securely attached

to cables with noncorrosive wire.

6) Cable trays and fittings shall be fabricated out of 2mm sheet-steel free from any flaws. Ladder type cable trays shall consist of side rails formed to channel shape and horizontal slotted ladder rungs with 250 mm spacing center. Standard length of all cable trays shall be 2500 mm. Perforated type cable trays shall be fabricated out of single sheet steel of 2.00 mm thick with perforation at the bottom.

7) All cable trays and their fittings shall be hot dip galvanized in accordance with IS:2644 - 1972. Galvanizing shall be uniform clean smooth, continuous and free from acid spots. Should galvanizing found defective, the entire batch shall be re-galvanized at the contractor's cost.

8) Size of ladder type cable trays shall be 600 mm W x 75 mm D and 450 mm W x 75 mm D. Size of perforated type cable trays shall be 300mm W x 75 mm D and 150 mm W x 50mm D.

9) Electrical load chart to be furnished.

10) All Earthlings as per IS 3043 (1987).

11) All bus bars shall be as per E91E grade (Electrolyte Grade Aluminum Bus Bars) with heat shrinkable type of PVC sleeves and SMC bus bar supports.

12) All PDBS (Power Distribution Boards) shall be flame proof and weatherproof enclosures.

13) All power socket outlets should be of 230 V single phase10 amps flame proof and waterproof.

14) A welding power socket of 440V three phase, 3 amps flame proof and weatherproof shall be fitted in fire pump room.

15) IE rules and relevant IS standards to be applied throughout the work.

2.30 TERMINATION AND JOINTING OF CABLES

i) Termination of Copper conductor power cables shall be by means of compression type lugs. Alternatively, tinned copper compression type lugs may also be used with application of corrosion insulating compound. Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment.

ii) Straight through joints for 1.1kV grade PVC insulated cables shall be with epoxy resin compound. Cable glands for terminating PVC insulated cables shall be double compression type and made of tinned brass.

iii) G.A drawings of cables trays including installation drawing of cable trays and supporting structure shall be submitted by the successful contractor for prior approval.

iv) Cable supporting structure (vertical & horizontal member) shall be fabricated from M. S. angle of size 50 x 50 x 6 mm and shall be hot dip galvanized.

2.31 EARTHINGS:

i) Entire system shall be earthed in accordance with the provisions of the relevant IEC recommendation / IS code of practice IS: 3043 – 1987 and Indian Electricity Rules, so that

the values of the step and contact potentials in case of faults are kept within safe permissible limits.

ii) Parts of all electrical equipment and machinery (rated 415 V) not intended to be alive shall have two separate and distinct earth connections each to conform to the stipulation of the Indian Electricity Rules. Apparatus rated 240 V and below may have single earth connection.

iii) The pump house and electrical items shall be provided with a ring main earthing systems each. Individual ring main earthing systems shall again be interconnected to main earthing.

iv) For the purpose of dimensioning the earthing lines/conductors, the duration of the earth fault current shall be taken as 0.3 seconds.

2.32 FIRE HYDRANTS

i) The hydrant system shall be designed to cater to the single largest fire demand likely to be posed at any of the various areas.

ii) Pumping philosophy remains same, as indicated in pump sets.

iii) Headers shall be laid above ground except at any crossings, where they will run through Hume pipes or through concrete pipe sleeves.

iv) At such locations, suitable corrosion protection as per IS 10221 shall be provided.

v) Hydrant and monitor posts shall be spaced at intervals of 30 Meters at jetty head area and 45 meters in the pipe trestle throughout the length of the fire line as per OISD 156 latest .

vi) Each hydrant post shall be of the type suitable for the installation of two single headed hydrants.

vii) Each water monitor and fire Hydrant shall have a gate valve/Butterfly Valve immediately below it, as per standard practices.

viii) Each hydrant shall be numbered from the pump house towards manifold.

ix) Each equipment used in the system shall comply with OISD 156 requirements in all respects.

x) Fire hydrant shall generally conform to IS: 5290. They are double headed hydrant and flow shall not less than 900 LPM @ 7 kg/cm2 on each head. This shall be tested to 21 kg/cm2 as per relevant BIS code. The ends shall be fixed with female couplings. Material of construction of hydrant valve branch pipes and coupling shall be SS: 316 of approved make. The Hydrants shall be situated at a Height of about 1.5M above the Ground level. Piping, hydrants have to meet OISD 156 norms latest guidelines. Double headed hydrant with two separate landing valves on 4” stand post hydrant 1.5 mtr. from ground level.

xi) Barricades shall be provided to hydrant system walls and boxes.

xii) Safe assembly point board in case of emergency shall be provided.

2.33 GRIT BLASTING & PAINTING

i) Painting of all pipelines and other steel structural both indoor and outdoor shall be as per the details given below: -

Surface preparation: Grit blasting to SA2.5 of all steel surfaces and pipe external surfaces after internal poly glass coating, to ensure complete removal of rust and exposing of bare metal (gray or near white surface of steel). Thereafter immediately but not later than 4 hours of grit blasting, the first coat of primer shall be applied on a clean dust free surface. At the time of grit blasting of poly glass coated pipe both ends shall be covered with suitable dummy flange to protect the internal poly glass coating.

Primer : One coat of aluminum filled phenolic amine epoxy mastic – 125 microns

Note: Contractor shall carry out surface preparation and application of one coat of Primer at contractor's/manufacturers facility.

Intermediate : Two coats of epoxy -150 microns/coat

Finish : one coat of aliphatic polyurethane – 50 microns for all the pipes, bends, reducers, and T joints.

The second intermediate coats of 150 microns and final coat of aliphatic polyurethane - 50 microns shall be applied after the completion of laying, aligning and hydro testing the pipelines.

ii) The total dry film thickness of the total painting shall be not be less than 475 microns.

iii) For electrical panels necessary metal treatment like hot alkaline degreasing shall be carried out. Cold water rinsing followed by pickling cold water rinsing, phosphating and passivation shall be carried out. The complete panel board shall then be dried out by the compressed air in dust free atmosphere. The boards shall be epoxy powder coated.

Note: 1. After application of each coat, DFT readings shall be measured in the presence of TPI for acceptance and submit the report to Port.

1. Entire Painting scheme including surface preparation shall be carried out in presence of representative of paint manufacturer and witnessed by TPI.
2. The painting carried out as above shall be guaranteed for a period of two years.

COLOR CODE FOR FINISH PAINT

a. The color code of the paint for Foam Pumps, Diesel engine and motors shall be quarter-gray conforming to shade No. 628 of IS: 1991.

b. Pipelines & pipe fitting and hydrants shall be painted in fire red color as per shade 641 of IS: 5.

c. Water monitor shall be luminous yellow conforming as per IS: 5.

2.34 REMOTE CONTROL SYSTEM

a) Remote control joysticks are 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 Equipment's used for remote control system, shall be explosion proof and the wiring shall be done using FRLS cables.

b) 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 FRLS.

c) The electric remote-control panel in the control room shall have the necessary controls for the following operations.

   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/ Base water monitors.
   iv) Manual start / Stop of all motor operated valves.
   v) Fog to jet control of all 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 motor operated valves.
   ix) Position of all monitors.
   x) Pressure in monitors & Hydrants mains.

d) A circuit diagram shall be provided on the control cabin.

e) All electrical Equip. / Accessories used in control panel shall be flame proof and suitable for use in zone I, Group II hazardous areas as per I.S:2148. The entire electrical system shall be totally waterproof so that during fire operation no short circuit can develop.

2.35 CURTAIN NOZZLE:

MOC	: SS 316,
End connection	: Screw end
Built in Strainer	: Yes
K factor	: K 55 to 110
Operating Pressure	: Not less than 2.1 Kg/cm^2
Working pressure	: 12 Kg/Cm^2
Approvals	: UL Listed / FM Approved

2.36 ALARM VALVE:

MOC	: Suitable for Sea Water Application
End connection	: Flange end ASME B 16.5 RF
Trim type	: variable Trim kit
Size	: 100mm
Working pressure	: 12 Kg/Cm^2
Approvals	: UL Listed / FM Approved

2.37 SPRINKLERS

MOC	: SS 316/Brass,
End connection	: Screw end
K factor	: K 80
Operating Pressure	: Not less than 1.1 Kg/cm^2
Working pressure	: 12 Kg/Cm^2
Approvals	: UL Listed / FM Approved

2.38 INTERNATIONAL SHORE CONNECTION

MOC	SS 316 (IS:3444 Gr 4.)
Working Pressure	12 Bar
Inlet	63 mm Slotted Flange
Outlet	63 mm Male Inst. Inlet as per IS: 903

2.39 MVWS SPRAY NOZZLE

End Connection:	1/2-inch NPT(M)
Min Effective working Pressure	1.4 bar – 7 bar
Material of Construction of Housing	SS316/Brass
Approval:	UL Listed/ FM Approved
Spray Angle:	Max. Spray Angle 120 degree

2.40 TRIPPLE PURPOSE NOZZLE

MOC	SS316
End Connection	63 mm dia coupling
Jet Flow	400 LPM
Spray Flow	225 LPM
Working Pressure	Up to 10 Bar
Approval:	IS 2871

2.41 INTERNAL POLYGLASS COATING

Description	Two pack iso aliphatic polyester acrylic glass fake coating
DFT:	1000 micron

Color	Off – White
Application:	Spray/ Hand application
Spreading rate:	1.06 m2 / litre at 750 microns.

2.42 GATE VALVE

Size	40 mm to 150 mm
System:	Spray system
Type	OS & Y Type Bolted Bonnet, Rising spindle
Operation	Hand wheel
Manufacturing Standard	API Standards
Flange End Connection	ASME B 16.5 RF

Material of Constructions:

Body, Bonnet, Wedge, Seat ring	A351GR.CF3M
Hand wheel	Malleable Iron / SG Iron

2.43 FLOW METER

Service	Saltwater
Accuracy	0.3 %
Size	250 NB
Flange	300#
Flow	1000 M3/hr
Weather Protection	IP67
Bus options	Pulse, Alarms, 4-20mA, Modbus (Hart, Mbus, TCP/IP options)

2.44 PRESSURE RELIEF VALVE

Service	Saltwater
Size Range	250 mm
Body Pattern	Globe
Pressure Ratings	Class 150 – 12.0 Bar Max
Maximum Working Temperature	Up to 82°C (180°F)
Connection Types	Flanged ASTM A 16.5 150#
Material	Suitable of Sea Water
Finish	Red Epoxy Coated

2.45 PORTABLE EQUIPMENT

2.45.1 JET NOZZLE WITH BRANCH PIPE

Working Pressure	7 Bar
Material	Stainless steel
Size	63 mm
Standard	IS: 903
Approval	ISI Approved

2.45.2 FOG NOZZLE PIPE

Material	Gun metal
Size	63 mm
Flow rate	500 LPM-Solid Jet 225 LPM - Dense Fog
Discharge Pattern	Solid Jet / Dense Fog Pattern
Finish	Chrome Plated
Working Pressure	7 Bar
Standard	IS: 952
Approval	ISI Approved

2.45.3 UNIVERSAL NOZZLE

Material	Gun Metal
Size	63 mm BSP inlet thread
Flow rate	500 LPM @7 Bar
Discharge Pattern	Hollow Jet/Spray/Shutoff
Finish	Chrome Plated
Working Pressure	7 Bar
Standard	IS: 2871
Approval	ISI Approved

2.45.4 FOAM BRANCH PIPE

Material	Gun Metal
Size	63 mm screw thread
Flow rate	500 LPM-Solid Jet 225 LPM-Dense Fog
Discharge Pattern	Solid Jet / Dense Fog Pattern

Finish	Natural Finish / Chrome Plated for GM
Working Pressure	7 Bar
Standard	IS: 952
Approval	ISI Approved

2.45.5 SAND SCOOPS

Material	Stainless steel

2.45.6 SAFETY HELMETS

Material	HDPE
Colour	White
Size	Universal
Standard	IS 2925 : 1984

2.45.7 PORTABLE WATER CURTAIN NOZZLES

Working Pressure	12 Bar
K Factor	K-58
Material	Stainless steel
End Connection	1/2" BSPT
Finish	Natural finish

2.45.8 STRETCHER

Material	Mild steel material
Diameter	30 x 1.5mm
Capacity	Approx. 150Kg
Size	20000(L) x 550(W) x 150 (H) mm

2.45.9 FIRST AID BOX

Material	Plastic
Colour	Green
Packing	Store all important & compulsory medicine, bandages, ointment, lotion, cream required in first treatment in case of emergency.

2.45.10 11KVA RUBBER HAND GLOVE

Material	Latex
Application	Electrical protection
Colour	white
Model	11KV

2.45.11 PORTABLE EXPLOSIVE METER

Display type	Digital, Analog
Display type	Liquid Crystal Display
Standard Alarm Levels	40% LEL
Measuring range	0 - 100% LEL
Alarm indication	Pulsating red LED with audible, 90db at 1 Meter
Battery Life	4 hrs. continuous
Humidity	0 - 95% RH Non - Condensing
Oper. Temp.	-10 deg. C to 50 deg. C
Resolution	1%
Sensor type	CATALYTIC TYPE
Approval	ISI Approved

2.45.12 FIRE PROXIMITY SUIT

Material	Aluminized glass fabric
	Kevlar yarn or equivalent threads
Shelf life	Minimum 10 years
Protection Level	Temperature of 1093 deg. approx.
Regular size	5'6" to 6'2" approx.

2.45.13 RESUSCITATOR

Component	Rubber face masks, a non-rebreathing valve, Bag-minimum tensile strengths of 105 & 95 kgf/cm^2 (10 and 9.3 MN/m^2)

2.45.14 ELECTRICAL SIREN

Material	Metal
Range	1 KM
Voltage	220 Volts
Noise Level	120 dB
Protection	Water & Rain

2.45.15 HAND OPERATED SIREN

Material	Steel
Features	Audible range 0.5 Km

2.45.16 WATER JEL BLANKET

Material	100% Woolen Blanket
Size	8 Feet's x 6 Feet's
Self-Life	3 Years for Medical Purposes and 5 Years for Fire Purposes
Approval	ISI Approved

2.45.17 POSITIVE PRESSURE TYPE SELF-CONTAINED BREATHING APPARATUS WITH SPARE CYLINDER

Working pressure	300 Bar
Material	Neoprene Rubber /steel braided
Equipment	Compressed air cylinder, lightweight, full face wide vision mask (with inner or nasal mask), speech diaphragm, spring loaded exhalation valve, L.P. warning whistle, pressure gauge, positive pressure demand valve working on pneumatic pressure, comfortable shoulder harness and light weight chemical resistant back plate to accommodate cylinder
Approved	PESO & ISI Approved

2.45.18 CLEAN AGENT MODULER EXTINGUISHER

Capacity	4 kg
Fire Rating	2A:34B
Average Discharge	95%
Operating Temperature	-30 deg. C to +60 deg. C
Expelling Agent	Nitrogen (UHP GRADE)

2.46 ADDRESSABLE FIRE ALARM SYSTEM

2.46.1 SCOPE

The scope of work under this head shall include design, supply, Installation, Testing and installation of Addressable Analogue Fire Alarm System. The work under this system shall consist of design, supply, installation, testing, training & handing over of all materials, equipment's and appliances and labour necessary to commission the said system, complete with Control panels, Flame/Gas detectors, FLP call points, FLP hooters, FLP junction boxes, Smoke Sensors, Gas detectors, relay modules etc. for interfacing with other systems. It shall also include laying of armoured cabling, necessary for installation of the system as indicated in the specification and Bill of Quantities. Any openings/chasing in the wall/ceiling required to be made for the installation shall be made good in appropriate manner.

2.46.2 STANDARDS

The System design shall meet the following design Standards and OISD 113, 156 or other applicable OISD standard compliance.

2.46.3 APPROVALS

The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc or Vds or LPCB or FM Approvals

The fire alarm control panel, detectors, devices, sounder, strobes etc., shall be UL /Vds/LPCB approved components.

2.46.4 FIRE ALARM PANEL (FACP)

General Requirement:

i) The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, panel modules including initiating circuits, control circuits, and notification appliance circuits, local and remote operator terminals, annunciators, and other system-controlled devices.

ii) The Bidder shall undertake the responsibility of the complete design, installation,

commissioning, user trials, training and maintenance of the System as required. The Bidder shall take all responsibility for preparation and installation of System Software into the FACP. The Software shall be such to be easily operated by the Client's Personnel and secured against Software errors, ability to be installed so as to incorporate more features at a later date.

iii) The fire alarm control panel shall meet the modular listing requirements. The control panel shall be capable to accommodate the required Loop cards. Each Loop shall support a minimum of 150 analogue addressable detectors/devices**.** The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs in that loop) in the unlikely event of a failure in the main CPU.

iv) The logic circuitry shall be based on high noise immunity solid state hardware. All addressable units shall be connected to the FACP through the Loop Cards and shall be addressed through individual numbers. The FACP shall be able to obtain analogue value for all detectors in the circuit through a pulsed digitalized current data. The FACP shall be able to analyse all analogue inputs from all addressable units, and through its own software and ambient level screening the FACP shall be able to identify fire, possible fire or fault conditions. The unit supervision shall be dynamic and continuous.

v) The FACP shall also give adequate warning signal whenever there is dust accumulation in detectors, and up to the point of its replacement it should be possible to change the level of ambient alarm calibration condition either by the use of software program operable by the owner or by resetting the detector.

vi) Short / Open circuit units shall also be reported at the FACP In such cases, the system through the use of fault isolators shall be able to isolate that segment between the two fault isolators. The missing Detectors/Devices shall also be reported at the FACP with identification of the location.

vii) The Bidder shall undertake to successfully complete & demonstrate all the required activation of safety interlocks / Interface / cause & effect activities from the Fire Alarm Panel.

viii) Each loop should have at least 10% to 15% spare

ix) Through the use of Addressable Output Modules and necessary AC/DC relays with the other utilities so that the people can be safely evacuated, and the fire spread is minimized.

x) Contractor shall do the required programming in the Fire Alarm Control Panel to achieve the required results. Some of the interfaces are detailed below

- ➢ Monitoring of Flame proof detectors
- ➢ Activation of PA System for making automatic announcement as per Client requirement
- ➢ Gas detection system

xi) The FACP shall also be able to discriminate between false alarms and fire conditions, as well as priority selection of alarm in case alarm activates in two or more remotely located units simultaneously. In such cases, the Manual Call Points shall have the highest priority.

xii) The FACP shall have its own Battery Backup of a minimum of 24 hours in normal run and then 60min in alarm condition. The Battery shall be of sealed lead acid re chargeable maintenance free type. Necessary battery calculations for the system shall be provided along with the bid.

xiii) The fire alarm panel temperature & Relative Humidity (non-condensing type) shall be as per site conditions. The voltage rating shall be from 17V DC to 31V DC, though the voltage may be change depending upon the working voltages of a proprietary FACP.

2.46.5 PANEL CONTROLS/ INDICATION

i) **Display & Indication:** The backlit LCD display shall at least be of 160 characters that indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises. It shall also provide Light-Emitting-Diodes (LEDs) that indicate the status of the following minimum system parameters: POWER STATUS, TEST STATUS, FIRE ALARM, FAULT, CPU FAILURE, POINTS DISABLED etc.

ii) **Alarm Acknowledge:** Activation of the control panel acknowledge function in response to new alarms and/or troubles shall silence the local panel piezo electric signal and the associated LED on the panel shall be turned ON.

iii) **Signal Silence:** Signal Silence function shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards.

iv) **System Reset**: Depression of System Reset switch shall cause all electronically latched initiating devices to return to their normal condition and the system reset operation starts. The associated Yellow LED shall flash during this operation to inform the user of the progress status of the reset cycle. The LED shall flash fast during the smoke detector power down sequence, then it shall flash slowly during the restart phase, and shall illuminate steadily for the restoral phase. The LED shall go out completely when the system is back to normal mode.

v) **Evacuation/ Fire drill:** Depression of the Drill switch shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

vi) **Lamp Test:** The Lamp Test function shall activate all local system LEDs, light each segment of the liquid crystal display to check all the components are working OK.

2.46.6 PANEL FUNCTIONS

The FACP shall minimum perform the following functions

i) Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions. System response to any alarm condition must occur within 3 seconds, regardless of the size and the complexity of the installed system.

ii) Supervise all initiating signaling and notification circuits throughout the facility by way of connection to monitor and control modules.

iii) Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.

iv) Upon alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler water flow, the following functions shall automatically occur:

a) The internal audible device shall sound at the FACP.

b) Display the alarm event on all the fire alarm panels networked together, all the repeater panels & the Fire graphical workstation.

c) The LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time/date.

d) Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

e) Activate visual strobes /Sounders based on programmed sequence. The visual strobe shall continue to flash, or the sounders will hoot until the system has been reset.

f) All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

2.46.7 PANEL FEATURES

The system shall be fully supervised for all fault conditions with distinctive alarm operated for fault and fire conditions. Test buttons and software features shall be provided to test the electronic circuits and detector health.

a) **System Programming**: Advanced software shall be used to configure the system during system start-up or system commissioning. Time and Date Stamps of all modifications made to the program must be included to allow full retention of all previous program version data. All System operational software is to be stored in FLASH memory. Control Panel disassembly and replacement of electronic components of any kind shall not be required in order to install the operations of the installed system to conform to future application code and operating system changes. It shall have the ability to download all system applications programs and “firmware” from a computer through a single point into the FACP.

b) The panel shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.

c) **Event Buffer:** The panel shall maintain a history file of at least the last 1000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries.

d) **Early warning capability**: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting.

e) It shall be possible to set individual smoke detectors for pre-programmed pre-alarm

thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated, and an alert displayed on the panel.

f) When the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on alarm level.

g) **Alarm verification delay**: The FACP shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm after start of alarm processing. If the alarm is not acknowledged within programmed delay, all local and remote outputs shall automatically activate immediately. The control panel shall ignore the alarm verification timer if another alarm is detected during the verification period.

h) **Enable/ Disable points:** The FACP shall allow the operator to restore a disabled point (device) in the system, allowing that point (device) to operate as originally intended by the application program of the system. Additionally, the system shall allow the operator to restore any group function, function, Panel, system module, “software - defined zone”, operator control, or time control function.

i) The FACP shall allow the operator to disable any point (device) in the system, inhibiting that point (device) from operating as originally intended by the application program of the system. Additionally, the system shall allow the operator to disable any group function, function, Panel, system module, “software - defined zone”, operator control, or time control function within the system.

j) **Check/Alter parameters:** The system shall allow the operator to manually turn on any system output point, or system function. Alter Smoke Detector sensitivity, message routing within the system shall be modifiable with this simple command from the control panel.

k) The system shall allow the operator to restore the primary (application program defined) operation to the Smoke Detector sensitivity and the message routing functions with this simple command from the control panel.

l) The system shall allow the operator to manually command and control relays. Relays shall be able to be commanded to “Latch”, to energize as a “High Priority”, or as a “Low Priority”, to “Energize”, or to “De-Energize”.

m) **Sensitivity Adjust**: The system shall provide Automatic Detector Sensitivity Adjust based on Day/Night schedules.

n) **Environment Drift Compensation**: The system shall automatically compensate for the drift in the sensitivity that can occur due to dust & environment changes. Environmental compensation shall mean that the sensing element adapts to long-term changes caused by dirt, humidity, aging etc. It shall even compensate for small amounts of normal ambient smoke. The detector shall periodically adjust and updates the sensitivity (% obscuration) baseline for its photoelectric sensing element. Periodically this information shall be written to its permanent memory. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

o) **Public Address System (PA system):** Public address system industrial with two way

communication at 4 places shall be provided. (1 – Control Room, 2 – Engine Room, 3 & 4 at Berth)**.** The PA system must use for marine applications, weatherproof.

2.46.8 SYSTEM STATUS DISPLAY

i) The system shall allow the operator to determine the status of individual system components, including active points, disabled points, and active points by panel.

ii) The LCD shall show the system time, and the number of active points and disabled points in the system in this section of the LCD Display.

iii) The LCD shall show the first active event of the highest priority. The text shall show the sequence number in which the displayed event was received, as well as its event type. It shall also display an identification message related to the displayed event.

iv) The LCD shall show the total number of active events in the system, by event type. There shall be at least three different System Event Types that shall be displayed, “Alarm Events”, “Supervisory Events” and “Active Trouble Events”. The Main LCD shall include queues for each of the System Event Types. The Main LCD shall allow the operator to access to the System Status information contained within those queues by pressing an associated select switch. Whenever there is an unacknowledged event in any of the System Event queues, the associated Status LED shall flash. Viewing each event listed in a queue shall acknowledge all events in that queue and shall cause the associated LED to illuminate steady.

v) **Passwords and Users:** The system shall support at least two password levels, master and user. Passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.

vi) **Report Generation capability**: The system shall have the capability to connect to a printer to print at least the following:

a) It shall give a detailed description of the status of certain system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the Main LCD and shall be capable of being printed on any of the connected system printers.

b) The system shall provide a report that gives a sensitivity listing of all detectors that have less than 75% environmental compensation remaining.

c) The system shall provide a report that provides a sensitivity listing of any particular detector or all detectors.

d) The system shall provide a listing of all of the firmware revision listings for all of the installed network components in the system.

vii) **One-Man Walk Test**: The system shall provide walk test for testing the entire fire alarm system. The walk test shall allow a single operator to run audible tests on the panel. When points are activated, each initiating event shall latch the input. The test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

viii) **Response based on event**: The panel software functions shall provide means to program a variety of output responses based on various initiating events.

ix) The system shall support at least 500 general purpose software zones for linking inputs to outputs. When an input device activates, any zone programmed into that device's zone map will be active and any output device.

x) **Sensor Check**: It shall be possible to view and check in the FACP, the sensitivity of each Multi Sensor & other detectors in terms of the current obscuration values and the current Temperature as sensed by the Temperature Sensors. It shall also be possible to print them in English periodically for client records.

xi) **Maintenance Menu**: The Main LCD in the FACP shall also allow the System Operator to access system maintenance functions through a multi-level password system.

xii) **Enclosures:** The control panel shall be housed in cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

xiii) The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

xiv) The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right- or left-hand hinging.

xv) **Power Supply:** The Addressable Main / auxiliary Power Supply shall operate on 240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP and the notification appliances.

xvi) The Addressable Main Power Supply shall also incorporate a battery charger for 24 hours of standby power for normal working & another1 hour in alarm condition using dual-rate charging techniques for fast battery recharge.

xvii) The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

xviii) The FACP shall have UL/ FM/Vds/LPCB approval.

2.47 DETECTORS

The Detector shall be analogue addressable type. The chamber should be easily removable for the purpose of easy maintenance. The address programming shall be done at site only. The detectors shall have a common base to allow easy interchange of various types of detectors.

2.47.1 ADDRESSABLE SMOKE CUM HEAT DETECTOR

i. The Multi Sensor shall analyse & correlate both thermal activity and smoke activity at a single multi-sensor location providing earlier detection over a broad range of fire conditions.

ii. The multi sensor shall be fully immune to false alarms and nuisance alarms. The smoke detection range shall be min from 0.2 to 3.7 %/ft obscuration, fixed heat detection shall be selectable to operate at 155° F (68° C).

iii. The smoke cum heat detector shall be able to sense incipient fire by detecting the presence of visible and invisible products of combustion. The detector shall be suitable for low voltage (17 to 31V DC) two wire supply.

iv. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions.

v. The detector shall have twin LED's for 360 degree viewing angle.

vi. The Multi Sensor shall have UL/ FM /Vds/LPCB approval.

2.47.2 <u>ADDRESSABLE SMOKE DETECTOR</u>.

i. The photoelectric or optical smoke Low Profile detectors must exhibit uniform response behaviour in course of item with status LED indication 360 Degrees, The detector design shall allow a wide sensitivity window, should be between1 to 4% per foot obscuration. Auto sensitivity adjustment. This detector shall utilize advanced electronics that react to slow smouldering fires. Electronics soft /rotary switch addressing

ii. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions.

iii. If Detectors have inbuilt fault isolator module additional fault isolator modules no need to be considered.

iv. Photo-Electric Smoke Detector Shall be FM/UL/ Vds/LPCB Approved.

2.47.3 <u>ADDRESSABLE HEAT DETECTOR</u>.

i. The Fixed Temp Cum Rate of Rise Heat Sensor shall analyse & correlate both fixed and rate of increase of temperature to detect early detection over a broad range of fire conditions. The heat detection shall be thro self-restoring, rate compensated, fast reaction thermistors and both shall be correlated by the sensor electronics for early fire detection and alarm by the FACP. The Heat Sensor shall be fully immune to false alarms and nuisance alarms. The fixed heat detection range shall be selectable to operate at 155° F (68° C) and rate of rise heat detection selectable to operate at 20° F (11.1° C) per minute.

ii. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions.

iii. If Detectors have inbuilt fault isolator module additional fault isolator modules no need to be considered.

iv. Heat Detector Shall be FM/UL/ Vds/LPCB Approved.

2.47.4 <u>DOUBLE ACTION MANUAL PULL STATION- SAFE AREA</u>

i. The Manual Pull Station shall be addressable double action push type with built in input modules to define the location. It shall come with a key operated reset lock for testing.

ii. The device shall be of durable extruded aluminium or moulded poly carbonate housing construction, red in colour and suitable for surface or flush mounting. The word FIRE shall appear in front of the Station in white colour. A clearly visible Single/Multi Colour LED shall

be provided which shall flash while polling & shall be permanently illuminated during alarm until reset.

iii. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions. Operating Voltage: 24V DC nominal (11 V-31V)

iv. The Manual Call point shall have UL/ FM/ Vds/LPCB approval.

2.47.5 SHORT CIRCUIT ISOLATOR

i. This unit shall be placed on the loop preferably after every 20 – 25 detectors & devices and shall be able to isolate electrical short circuit in the wiring. All the other detectors shall remain functional because of the Class A wiring of the loop.

ii. If a wire-to-wire short occurs, the isolator module / Base shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

iii. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

iv. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions. Operating Voltage: 24V DC nominal (11 V-31V)

v. The Isolator shall have UL/FM/ Vds/LPCB approval.

2.47.6 SOUNDER CUM STROBE

i. The sounder cum strobe shall be electronic type and shall give continuous/ intermittent audible alarm from a command from the main FACP whenever any detector or call box operates. Sounder cum strobe placed in same loop with required sounder base. The sound output from the sounder should not be less than 95 - 100 dbA at 1 Mtr. level so that the required dB level of 65 dB shall be achieved through out the facility. It shall be come with required mounting accessories for directly mounting on the wall/ceiling. The sounder cum strobe shall be programmed to get activated in event of an alarm from a single detector/device or a group of detectors/ devices.

ii. The strobes shall be an electronic visible warning signal device that flashes at least once every 1.5 Secs in an event of an alarm. The strobe light shall use high intensity multi candela Xenon flash tube with low current requirements with selectable candela range from at least 15 candela to 110 Candela. The strobe shall give out a light intensity of at least 110 Candela. The outer cover of the Strobe shall have a printed fire signal warning. The electronic circuits inside the strobes shall be compatible with DC alarm supervision & meet the required safety standards. The strobes shall be mounted on the sounder or on the wall/ceiling.

iii. It shall be capable of being directly mounted on the wall/ceiling. The sounder cum strobes programmed that it shall be activated when in a wing in event of an alarm from a single detector/device or a group of detectors/ devices. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions. Operating Voltage: 24V DC nominal (11 V-31V).

iv. The Isolator shall have UL/FM/ Vds/LPCB approval.

2.47.7 ADDRESSABLE CONTROL RELAY MODULE

i. The control module NAC may be wired for Class A/B wiring circuit with the capability to take at least 1A @24VDC of inductive A/V signal load, or 2A @24VDC of resistive A/V signal load. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions. Operating Voltage: 24V DC nominal (11 V-31V)

ii. The Isolator shall have UL/FM/ Vds/LPCB approval.

2.47.8 ADDRESSABLE INPUT MODULE

i. The Addressable Input Module shall provide location specific addressability to a single initiating device or multiple devices at the same location by monitoring normally open dry contacts and the wiring to an end-of-line resistor. Closure of the monitored contacts shall initiate an alarm or other response as programmed at the fire alarm control panel. An open in the monitored circuit wiring shall be reported as trouble on FACP. It shall be possible to program to maintain the alarm condition even if the initiating device contacts are momentary.

ii. The addressable input module shall come with supervised Class B monitoring of normally open dry contacts. The module shall come with inbuilt over voltage protection circuits to counter any interference from electrically noisy equipment. The module shall be housed inside a proper enclosure to prevent any ingress of dust.

iii. The input modules shall be used for interfacing Fire status of Gas release panel, Fire, Fault status of Sprinkler flow status, flame detector, with the proposed fire alarm system. The device/detector temperature & Relative Humidity (non-condensing type) shall be as per site conditions. Operating Voltage: 24V DC nominal (11 V-31V)

iv. The Isolator shall have UL/FM/ Vds/LPCB approval.

2.47.9 INFRARED HYDROCARBON GAS DETECTOR

i. The detector specially designed to detect the different gases and oils. Gas detector is a diffusion-based, infrared combustible gas detector that provides continuous, fixed monitoring of flammable hydrocarbon gases from 0 to 100% Lower Flammable Limit (LFL). Standard device outputs include an electrically isolated 4-20 mA signal and RS-485 serial communication.

ii. Ideally suited for protection of challenging on/offshore oil and gas facilities and other downstream hydrocarbon applications, the detector shall be certified for use in Class I, Divisions 1 and 2, and Zones 1 and 2 hazardous areas.

iii. The Gas Detector shall be capable of detecting of flammable hydrocarbon gases and vapours. The gas detector shall have performance certified to methane, propane, ethylene, and butane, and is shipped from the factory set and calibrated to one of these gases.

iv. The gas detector shall have below mentioned specifications:

- No undisclosed failure modes.
- Explosion-proof, stainless steel housing with tethered weather protection baffle.
- Built-in tri-color LED eliminates need for external display module.
- Heated sapphire optics deliver long-lasting, high performance detection capability.
- Immune to damage from exposure to constant background gases or to high gas concentrations.

- Factory set and calibrated to methane, propane, ethylene, or butane.
- Alarm Set point Range Low Alarm: 5 to 60% LFL / High Alarm: 5 to 60% LFL.
- Accuracy: ±5%
- Self-Diagnostic Test: All critical tests performed once per second.
- Detector Housing Material: Stainless Steel (316 Cast)
- Temperature Range Operating: As per site conditions
- Humidity: As per site conditions.
- Detection Range: 0 to 100% LFL standard.
- Detectable Gases: Most flammable hydrocarbon vapours are detectable. i.e. methane, propane, ethylene, and butane.
- Device Configuration: Configuration parameters include tag number, measurement range, signal processing algorithm, alarm levels, and other selectable parameters.
- FM or CE (including ATEX 94/9/EC) certifications.
- This product must suitable for marine applications.
- Any software to program / configure the detector shall be considered.
- The enclosures, junction boxes, glands etc. must be flame proof.

2.47.10 UV/ IR FLAME DETECTOR

a) Features:

- Rugged Explosion-Proof enclosure for Hazardous Environment
- FM / ATEX / PESO Approved Enclosure
- Confirm to EN-54
- Visual Indication for Normal & Fire condition
- Triple sensor UV / IR flame detector for hazardous area application.
- The detector shall detect 1 Sq. ft fire at 25-35 metres distance.

b) TECHNICAL SPECIFICATION

RELAY CONTACT RATING	1A at 24VDC,0.5 at 12 0V A C
CABLE ENTRY	M25 X 1.5 -2Nos.
SENSING ELEMENT	UV & IR
RANGE	UV: 185-260 nm IR: 3000-5000 nm
INDICATION	Normal-flickering green led Fire – red led
OPERATING TEMPERATURE	Bidder to provide as per site conditions
SUPPLY	24VDC +/- 20 % (RESETTABLE)

SENSITIVITY SELECTION	**RANGE OF SELECTIONS** (a) low sensitivity -1 (b) normal sensitivity - 2 (c) high sensitivity (factory set) -3 (d) very high sensitivity -4 1.
MATERIAL	CAST ALUMINIUM L M6
FASTENERS	SS 316
EQUIPMENT RATING	EXPLOSION PROOF FOR CALSS I, DIVISION 1, GROUPS A, B, C AND D; AND DUST - IGNITION PROOF FOR CLASS II/III,DIVISION 1, GROUPS E,F & G; HAZARDOUS (CLASSIFIED) LOCATIONS, INDOOR/ OUTDOOR (NEMA TYPE 4X) 1026 II 2G Ex d IIC Gb 1026 II 2D Ex tb I IIC Db, IP 66
Certificate for Enclosure	FM APPROVAL FOR ENCLOSURE

2.48 FLP MANUAL CALL STATION

The Conventional flame Proof Manual Call Point shall be designed for instant manual actuation of fire notification system. It shall trigger manual fire signal, by breaking the glass. Flame Proof Manual Call Point shall be designed to withstand outdoor and the device shall be provided with Hammer and Chain.

a) Electrical Specifications

Operating voltage : Nominal 12 V/24 VDC

b) General Specifications

Type of protection : Flameproof-Exd

Area classification : Zone 1 & 2

c) Mechanical Specifications

Material :Aluminium Lm6

IP Protection :IP 65 and above

Finish :Anti corrosive epoxy powder coated

Cable Entry :2 x 3/4” ET

Gasket	:Neoprene
Hardware	:Stainless Steel(SS-316)

2.49 FLP HOOTERS

Explosion proof cum intrinsically safe hooter. In the main chamber Intrinsically, safe circuit is housed, and it is duly wired up to terminal chamber through sealed bushes. The horn unit is placed on the main chamber cover and the output signals are taken through sealed coils. Neoprene ' O' rings are provided for the weatherproof protection.

Mechanical Data

Material	: Cast Aluminium LM 6
IP Protection	: IP 65 as per IS 13947 / 93(IEC 60529 / 1989)
Finish	: Anti corrosive Epoxy - Powder Coated
Hardware	:Stainless Steel

Electrical Data

Voltage	: 24 V DC or 110 V / 230 V AC- 50 Hz
Sound Output	: 106 db 900 Hz On & OFF alternatively at 1C/S
Earthing	: External : 1 No. - M6 Internal : 1 No. - M5
Type of protection	: Flame Proof - Exd T6
Area Classification	: Zone 1 & 2
Gas groups	:Group I, II A, II B, II C
Apparatus Standard	:IS - 2148/2004(IEC 60079-1/2001)
CMRI Certificate No	:CMRI / TC / S / H388
Approvals	: CCE, BIS

2.49.1 CABLES

i. All insulated copper, multi strand, ATC, FRLS, FS, Twisted Pair, mylar tape Shielded Armoured / Unarmoured cables, over all outer sheath shall be RED in colour, shall be 650V grades and shall generally confirm to IS – 8130, IS – 5831 & IS –694 and meet the signal cabling requirement of the system manufacturer. The cable conductor shall be of 48/ 0.2 mm size with 1.64 mm dia. with at least 10- 12 Twist per meter.

ii. The strands of cable shall not be cut to accommodate & connect the terminals. Terminals shall have sufficient cross-sectional area to take in all the strands. Cables shall be laid by skilled and experienced workmen. Great care shall be taken while laying cables to avoid kinks. At all changes in directions (vertical & horizontal planes) the cables shall be bent smooth with a radius

as recommended by the manufacturers.

iii. Cabling between UPS point to the FACP shall be in the scope the Vendor.

2.49.2 POWER SUPPLY UNIT

The power supply unit with an isolation switch shall be used only if the fire alarm panel is not able to take the sounder load. The 10A / 2A power supply unit shall be with 24 Volts, with required sealed maintenance free lead acid battery to provide 30 Min back up. It shall have an inbuilt trickle and boost charger. An indication shall be provided to indicate the availability of AC power source. An inbuilt buzzer shall be provided which shall indicate that the battery is in deep discharge condition. This power supply unit fail status shall be monitored by the FACP. Necessary addressable input modules shall be considered for the same while quoting for power supply unit.

2.50 FIRE ALARM SYSTEM TESTING

i. The correctness of cabling with continuity as per the approved shop drawings.

ii. The Cause & Effect matrix testing as directed by MPA/Consultant.(provision shall be made in control panel for MOV of Jumbo curtain nozzles and Motorised valve shall be opened when any detectors (gas/flame) activated)

iii. **FACP**

The FACP shall be checked for basic tests such as visually checking input voltage and amperage. All the loops one by one shall be de wired to check for fault signal indication in the FACP. The Power Source shall be cut off and checked for stand by Supply from the Batteries. After six hours the FACP Source shall be switched on to check for auto switch over to the Mains mode. The operation LCD/LEDs in the FACP facia is tested. Walk Test of Detectors/ Devices to be checked from the FACP.

iv. **SMOKE DETECTOR**

a) The testing shall be carried out for each loop / zone, initially one detector in a zone and subsequently 2 or more are disassociated detectors in each zone with time lapse between the detectors to test for Alarm Priority, Alarm Queuing and Call Logging.

b) An identified detector will be subjected to smoke aspiration from smoke spray cans which give smoke shall be held at 0.3 M distance from the detector. **Contractor shall consider the cost of smoke spray cans in their Installation cost of the system**.

c) The FACP should indicate increased analogue output for that address and after the programmed delay time, a fire alarm signal shall be indicated. This delay shall be utilized for alarm verification.

d) The same test shall be carried out for two detectors in the same Loop but in different rooms. The FACP shall indicate Pre-Alarm higher analogue levels for both detectors in its display with separate identification for both fires. One of the detectors in question be subjected to higher and longer levels of smoke aspiration. The FACP should give priority alarm for this

address. The printout shall indicate individual addresses of the detectors with achieved analogue values and the time of event. This test shall be carried out for different Loops as well as for 2 Loops simultaneously. One detector of each type will be disconnected and subjected to slow dust build - up by means as desired by the Bidder and again connected in the circuit. The FACP shall indicate the changed ambient levels and automatically adjust the analogue values for the same. These Detectors shall then be replaced by new Detectors of identical type and the FACP shall then be programmed accordingly and checked. The Bidder will take custody of the removed detectors without additional cost to the Owner.

v. **HEAT DETECTOR**

The same tests in the same sequence shall be carried out for this Detector but with the application of hot air from a hair dryer held at approximately 60 cm distance.

vi. **MANUAL PULL STATION**

Manual Pull Station in each area is opened & tested for its alarm. Every Manual Pull Station will be actuated in every zone in all locations to check for the alarm response. One half of the testing shall be made on a stand by battery power.

vii. **LOOP**

Any part of the Loop shall be short circuited. The FACP shall indicate the communication failure of all the devices connected in the short-circuited segment. After the short circuit is corrected, the Fault Isolator shall return to its normal status automatically, this being reflected in the FACP. The Loop shall then be in normal operation again. Any part of the Loop shall be de wired and tested as given above. Check whether all events are displayed in the Repeater Panels and all LEDs in the Repeater Panel glows for the respective events.

viii. Gas Detector: Shall be tested as per OEM recommendations.

ix. FLAME Detectors: Shall be tested as per OEM recommendations.

Any other test that are required for checking the quality & performance of the system and all other tests as required by the Consultant/MPA at the time of handing over shall be carried out.

2.51 TOXIC GAS DETECTION SYSTEM

Fixed gas monitors operate around the clock to protect equipment and personnel from hazardous toxic or explosive gases. These monitors support many types of gas sensors and should be carefully selected to alarm at levels below those that are dangerous to life or health, or that would represent an explosion hazard. In typical systems, multiple gas monitors may be connected to a System Controller that provides a clean and reliable source of DC power and includes remote high visibility strobes or loud sounder horns that make it possible for employees and visitors to move to safe location in the event of a gas leak.

2.51.1 TOXIC GAS DETECTOR

i) These Toxic gas sensors shall be installed at unloading arm area / pipe manifold area to monitor the gas levels and give the signal if the pre-defined levels exceeds the gas.
ii) High-quality catalytic combustion sensor, anti-smoke, anti-jamming Explosion-proof certification

Exd IIC T6 Gb, protection grade IP66.

iii) Comply with EMC design standards, resist high-intensity pulse surge current impact, high reliability and stability.

iv) RS485/4-20mA/Power bus, 1 set of sound and light alarm interface, 1 set of passive switch output

v) Automatically track zero point to prevent drift, temperature compensation, multi-level calibration.

vi) Infrared remote control (optional) can realize operation without opening the cover in dangerous places, such as: modify alarm point, address, concentration calibration, zero-point calibration.

Technical Specification of Toxic Sensor:

Detection principle	: Natural Diffusion
Detection gas	: Combustible(%LEL) Oxygen(%VOL) Toxic(ppm)
Response time	: T90<30 seconds
Sensor type	: Catalytic combustion, Electrochemical, Semiconductor, PID
Enclosure material	: Die-cast aluminium alloy
Explosion-proof mark	: EXd ll CT6
Protection level	: IP66
Output	: 4-20mA, RS485, switch relay
Voltage	: DC24V (+-15%)
Humidity	: As per site conditions
Temperature	: As per site conditions

2.51.2 GAS CONTROLLER

This Gas Controller which are installed at Unloading area is used to monitor gas detector data. Can connect up to 2 gas detectors, with 4-20mA signal, has buzzer and alarm light, Metal case, easy to operate. Shall be installed in pump room, the required cabling between the controller and Detectors shall be laid.

Technical Specification:

1. Support channel : 2 channels (4-20mA)
2. Display type : LED
3. Output signal : 4-20mA RS485
4. Power supply : 220V(195-235VAC/50-60HZ)
5. Relay output : 2 sets passive normally open/normally-closed contact
6. Alarm type : Sound and Indicator light alarm
7. Alarm volume : ≥90db
8. Using environment : As per site conditions
9. Way to install : Wall mounting (non-explosion-proof place)

2.52 CCTV SURVEILLANCE SYSTEM

A. STANDARDS & GEENRAL REQUIREMENT:

i) The IP CCVT equipment and accessories covered in this specification shall be designed, supplied, installed, tested & commissioned in compliance with the relevant CCITT, ITU-T standards conforming to Cat.6 and TIA/EIA 568A/B.2-1, ISO/IEC 11801, EN 50173, AS/NZS 3080: 2004 standards. Shall support class E applications, ISO/IEC 8802.3 standards. They shall also conform to the relevant standards of the Indian Standards Institution, wherever available, so that the specified aspects under Indian Conditions are taken care of. The power cable and lighting equipment shall confirm to relevant IS standards. All electrical equipment shall conform to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified therein for installation and operation of electrical equipment and plants. All Equipment and installation shall comply with relevant statutory requirements of the Government of India and the Government of Goa. The equipment and accessories for which Indian standards are not available shall be designed, manufactured and tested in accordance with the latest standards published by any other recognized National Standards Institution.

ii) Implementing Infrastructure for this project shall be considered for a total of 3 camera locations with OF cabling, LIU's, weather proof outdoor JB's, network switches, UTP cabling, power cabling, Mounting Poles, VMS, Servers, Storage, all Licenses, and all accessories. List of these items is furnished at BOM.

iii) The proposed tender envisages a deployment of a total 3 cameras with integrated IR illuminators (PTZ). The installation involves all these 3 nos. and these are to be integrated to the new NVR system, to be supplied in this tender.

iv) All common equipment's like 72" industrial grade LED monitors (large video screens), work stations, storage & recording system and any other hardware shall be installed at Control room which is located at Control tower in pump house. They are to be connected to cameras by laying OFC / UTP cables. Required video management software, OS for servers, storage & recording upto 90 days and 3 cameras on disk storage, licenses for viewing clients all required servers, application software shall be included in the scope of work.

v) All the equipment's like IR based PTZ, network switches, camera management software, Camera servers, recording, storage & back-up devices, etc., used in the project shall conform to PAL system, ONVIF-S & G standards.

vi) All the active and passive components used in the OFC backbone shall conform to Gigabit Ethernet LAN standards conforming to Cat.6, TIA/EIA 568A/B 2.1, ISO/IEC 11801, EN50173, AS/NZS 3080: 2004 or above. Shall support class E applications, ISO/IEC 8802.3 standards. The design of equipment shall also include facilities for easy inspection, testing, maintenance and general repairs at site.

vii) Integrated IR camera shall be (min. 2 MP) two mega pixel cameras & capable of producing simultaneous video streams in MJPEG and H.264/MPEG4 formats at 12 fps, for viewing at client work stations, recording in Storage box servers and user selectable as per requirement. Power for cameras shall be drawn through necessary 230V AC to DC/AC adapters and necessary AC/DC jack/pin arrangement shall be available.

viii) Proper mounting/positioning arrangements shall be arranged for fixing 72" large video screens LED monitors on wall/floor, rack optimized servers and other network devices in

switch racks, all work stations for monitoring, recording, PTZ movements, different camera management operations to be placed on aesthetically designed control desks.

ix) All cameras shall be configured for various presets positions, fixed position, auto panning, etc., as per MPA requirements. Camera wise viewing, recording, retrieving and different frame rates, resolution and to be implemented.

x) To monitor the operation of the tower mount water cum foam monitors during the fire conditions for each Tower monitor. The location and positions to be as per site requirements. Ensure that each camera must have wide angle and long distance coverage, angle adjustable and 360 degrees rotation, pan tilt and zoom also should have optical zoom. The camera shall be for marine applications and weatherproof.

xi) CCTV Surveillance System shall operate on 230 V, 50 Hz single-phase power supply. Power for all the equipment will be conditioned using on-line UPS with minimum 30 minutes or more back up.

NOTE: CCTV feed of firefighting system should be connected to the MPA's Digital Surveillance System Control Room located at Main Administrative Building, Headland Sada. A secondary 72inch larger monitor shall be placed in first floor Admin office.

B. Technical Specifications

Integrated IP PTZ outdoor Camera (2MP) with IR Illuminators –Qty: 3 NOS.

- Vandal proof enclosure of aluminium-alloy or stainless steel with IP 66 rating and sun-shield protection of same make of camera.
- Optical Zoom 30X
- Aperture/Focal Length F1.6~F3.5, f=4.7~94mm approx.
- Image Sensor 1/2.8" or 1/3" CMOS or CCD
- Scanning System Progressive scanning
- Effective Pixels 2.0 Mpx
- Resolution 1920×1080@25 fps or above
- Image Mirror Off/H-mirror/V-mirror/HV-mirror
- Image Freeze Shall be Available
- Defog Processing Shall be Available
- Supports infrared light focusing, to avoid virtual focus Shall be Available
- Video Compression H.264 High profile/M-JPEG
- Network Port 1 RJ-45 10M/100M self-adaptive Ethernet Port
- Rotation Angle Pan: 360°; Tilt: +40° ~ -80°
- Power Supply : With Built in Integrated power for 2 IR Illuminators

- Operating Temp. as per site conditions
- Humidity as per site conditions
- Construction High-strength aluminium alloy & stainless steel
- IR LED Dual IR LED with Wave length: 850nm; Coverage distance: 330ft (100m)
- Window wiper, built-in heater and window defroster Shall be Available
- Mounting Surface: wall, pole,
- Window Type HD transparent glass
- Shall comply with PSIA/ONVIF-S/open protocol standards& listed on ONVIF web site for ONVIF S profile conformance for inter-operability of all similar devices
- Certifications and Approval: CE, FCC, UL
- Power supply- Input 230VAC (+/- standard variations) shall be tapped from the power cabling being laid in the project. Required surge protection device, outdoor junction
- Box for terminating various cables shall be provided at camera end.
- Accessories- As required & mounting poles as per specs.

C. <u>Storage & Recording system :(Qty.: one no)</u>

i) The system shall be of latest configuration available in the market with latest Windows Operating System and LED monitors as per the requirement. The server handles all communications with the cameras connected in the system. It also handles recordings, events and user management in the system. System shall ensure that once recorded, the video cannot be altered; ensuring the audit trail is intact for evidential purposes. System shall provide sufficient storage of all the camera recordings for a period of 90 days 4CIF, 20FPS or with better video quality using necessary compression techniques. Bidder shall submit the Storage and Bandwidth calculations. The recording resolution and frame rate for each camera shall be user programmable. In order to optimize the memory, while recording, video shall be compressed using MPEG-4 or better standard. System shall have facility of 20% additional camera installation beyond the originally planned capacity. System shall be triplex i.e. it should provide facility of Viewing, Recording & Replay simultaneously.

ii) The offered system shall have facility to export the desired portion of clipping (from a desired date/time to another desired date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc.

iii) It shall be possible to search for recordings in the server by camera, date and time. If date and time is specified, playback shall commence from that date and time. It shall be possible to playback more cameras simultaneously.

iv) The system shall be of latest model with minimum configuration. The Server will be multitasking / multiuser to allow simultaneous use by multiple operators. The system shall be scalable for multi users simultaneous. Offered Storage Subsystem shall support RAID levels 1, 5. Latest core processor 3.2Ghz or higher, 8MB cache or suitable, 16 GB DDR3 RAM, SATA Hard Drives, SGVA display Card (preferably Windows accelerated card) and support (1024 x 678) resolution with IMB VRAM. 10/100/1000 LAN port, 4 USB ports, 1 Serial port, 1 VGA, 1 parallel port, 2 PS/2 ports. The Server shall provide a removable media back-up

device (Hard drive or equivalent). The back-up device shall be used for system setup, backup operations, and for archival operations. The back-up device shall be adequately sized to permit backup of all databases and system files on a single piece of media such as DVD R/W drive.

v) The storage equipment or NVR shall have built in / preloaded VMS software to handle the 4 cameras, Bidder to select accordingly.

D. Large video screens (LVS)/monitors (Qty: 2nos. One at MPA berth control room and one at MPA admin office First floor)

- Screen type: Light Emitting Diode (LED)type & 24 X 7 heavy duty operation
- Screen Size: 72 inches or above measured diagonally
- Resolution :1920 by 1080 pixels or better
- Video Enhancement Features: Contrast, Color adjustment required
- Features: Auto Channel Search, On-screen menu display required
- Aspect Ratio: 16:9 / 4:3.
- Analog Video standard: NTSC/PAL auto detect
- Analog Video Port: 1V P-P BNC Co-axial cable input or 1 no. component RCA port
- Digital Video port: 1 No. VGA port, 2 No. HDMI port; All ports shall be built-in
- Network Port: 1 no. RJ 45 Ethernet port
- Power Supply: 200 VAC to 230 VAC, 50Hz or with suitable adapter included.
- Accessories to be supplied: Power cable with Indian-type plug, Remote Control, VGA cable and HDMI cable of required lengths, metallic frame for mounting 4 nos. of LVS, Wall-mount bracket and Desktop Stand
- Protection: Lightning, Surge, Humidity protection shall be built-in
- Operating Temperature: As per site conditions.

E. <u>CCTV camera Pole Specifications: (as required)</u>

- The Pole shall be designed as per IS 875 for wind load calculation and IS800 for design practices.
- Wind load shall be considered based on area of pole structure and also ladder, etc.
- The minimum thickness of any fabricated steel part or structural pipes shall be 3.2 mm.
- Test certificates shall be made available for all materials.
- All ferrous metal shall be hot dip zinc galvanized according to the applicable Standards after fabrication.
- Anchor and foundation designs shall be based upon the soil characteristics.
- Provisions shall be made for climbing ladder
- Height Shall be as per site condition and as required

2.53 QRMH MOORING SYSTEM

i) In this system QRMH Devices are placed at berth to hook the ships and shall have sufficient load bearing capacity to hold it.

ii) A Quick Release Mooring Hook (QRMH) is a device used for safe and efficient mooring and release of vessel at sea-ports. There is a need for the ships to be untethered quickly, in case of a fire or explosion on the terminal.

iii) Shall be Single operated Single/quadruple Arm Quick Release mooring hook system, explosion proof, marine application, higher side holding capacity, designed as per ABS rules, with required civil foundation works, hand release switch provision at Berth side near the QRMH.

iv) The QRMH deck shall be concrete structure to hold fix the device with the help of heavy-duty anchor bolts. The drum diameter shall be min. 300mm, Reversible type, Foot switch, shall have mechanical brake system, remote release from indoor control room by means of electric release.

v) **Coating specification:** The Painting shall be as per site conditions.

vi) The power and communication cables between the remote release stations to QRMH device shall be provided, the size of the cable shall be as per OEM recommendations, also all the cables and fittings shall be flame proof type.

2.54 FIRE SYSTEM PIPE LINES PRESSURE MONITORING STATION

i) This shall consist of pressure transmitters and a monitoring display and connect through suitable cables. The sensor shall be placed at remote point of the fire pipelines in different locations to monitor the system pressure and a display or monitoring station shall be installed inside the pump room to know the pressure in the fire pipe lines.

ii) The pressure transmitter shall be designed for hazard applications. The construction of device shall be hard and heavy duty, IP 67, Ex Gas Groups. The same be designed up to 20Bar pressure with 0.1 class, Digital/ analogue type, multiple settings low/medium and high.

iii) The monitoring station inside the pump room shall have a digital display to show the pressure readings and give the alarm when the measured pressure is below the set pressure, a local sounder shall be attached, the panel shall have reply provision for third party integration.

iv) The control panel/ monitoring station shall have functional keys like Silent, Acknowledge, drill, etc. The same shall be IP 67 Housing, 230V AC power supply, Wall mount type.

2.55 ROLLING SHUTTER:

Design, Supply & Fixing of GALVALUME ROLLING SHUTTERS, 4Mtrs height 3M wide, worn wheel drive handle for operation, 2mm thickness Sheet with required civil work to fix in the pump room. The Shutter shall be painted with Epoxy paint.

2.56 DG SET:

i) DG Set 100KVA shall be with roof sheet and suitable of marine application. Engine shall be Radiator cooled with exhaust piping. The exhaust pipe shall be insulated as per existing design. Supply Installation, testing and commissioning of DG AMF synchronise panel suitable for above mentioned DG set with automatic change over between two sources made of 2mm sheet and main change over switch shall have 150% rating.

ii) **General Specification:**

Duty	Prime
Power Rating kVA / kW	100/80
No. of Phases	3 Phase
Output Voltage and Frequency (V and Hz)	415 V, 50 Hz
Power Factor	0.8 (lagging)
Current (A)	139
RPM	1500

iii) **Engine Specification:**

- 6 cylinder, In-line 4 stroke, radiator Cooled Engine
- Well-designed air handling system with Dry type, heavy duty, replaceable paper element air cleaner with restriction indicator
- Air to air after cooling
- Optimised turbocharger for increased altitude capabilities
- Optimised fuel consumption with Inline fuel pump with mechanical governing
- Spin on dual fuel filter with water separator
- Standard integral set-mounted radiator system, designed and tested for 50°C ambient temperature
- Full flow spin on lube oil filter
- First fill of lube oil and coolant
- Electrical starter motor with soft start engagement feature
- Battery charging alternator
- 1 x 12 V DC battery

iv) **<u>Alternator Specification:</u>**

- Brushless type, Screen protected, Revolving field, Self-excited alternator conforming to IS/IEC 60034-1
- 3 Phase reconnectable winding with 12 terminals brought out for connection
- Better motor starting capability
- Best in class efficiency
- Compact design with sealed bearings for longer life and lesser maintenance
- Impregnation on all wound components for better mechanical strength

v) **Control Panel**

- Control panel is manufactured with 14/16-gauge CRCA sheet and is powder coated for weather-proof and long lasting finish. The control panel consists of the following parts:
- Latest Microprocessor based Controller
- Aluminium bus bars with suitable capacity with incoming/ outgoing terminals
- Indicating lamps for 'Load ON' and 'Set Running'
- Instrument fuses duly wired and ferruled
- MCCB of suitable rating with overload and short circuit protections.

vi) **The controller Features shall include following:**

- The Control shall be microprocessor-based generator set monitoring and control system. This control shall include an intuitive operator interface that allows for complete generator set control as well as system metering, fault annunciation, configuration and diagnostics.
- Intuitive operator interface shall include LED backlit LCD display with tactile feel soft-switches & generator set status LED lamps
- Shall be for Remote Start-Stop
- Engine Metering shall include: Oil pressure, Engine temperature, starting battery voltage, Engine running hours \
- AC Alternator Metering shall include: L-L Voltage and L-N Voltage, Current (phase and total), kVA (phase and total), Frequency.
- Engine Protection shall include: Low lube oil pressure, High/Low Coolant temperature, Battery Over/Under/Weak Volts, Fail to Crank/ Start, Sensor failure, Cranking lockout, Low fuel level
- AC Alternator Protection shall include: Over/Under Voltage, Over/Under Frequency, Loss of AC sensing
- Data Logging shall include: Engine Hours, Control Hours and up to 5 recent fault codes
- Shall have configurable glow plug control
- 12 Volt DC operation
- Sleep mode
- Modbus interface (RS485 RTU)
- In Power Compatible (PC based service tool)
- Certifications shall meet the requirement of relevant ISO, EN, Mil Std. and CE standards
- Hospital grade silencer with rain cap suitably optimized to meet stringent noise

2.56.1 DG SET CARBON EMISSION

Design, Supply, fixing and commissioning, testing of Digital screen with required back-end controllers to monitor the DG sets carbon emission and sound level. The controller shall have provision to give the alerts when the preset values exceed and also have third party

integration facility. All items shall be SS316L or suitable of marine applications. Required cabling between the DG sets and controller shall be considered. Fixed outdoor flue sensors required to measure the carbon level shall be considered. Total Engines 4 no's. The Digital screen and associated controllers shall be placed in pump house. The controller shall have built in sounder.

2.57 LAN AND TELEPHONE CONNECTIVITY

Supply, Fixing and establishment of min. '300Mbps wireless bridge for LAN and Telephone connectivity' has to be done from firefighting pump house building to MPA head office building. The Railway signaling Building which is approx. at an aerial distance of 500 meters from pump house already has wireless connectivity with MPA head office building. The contractor shall provide the connectivity from firefighting pump house to Railway signaling building. Also contractor shall check the availability of sufficient capacity in the connectivity from railway signal building to MPA head office, if not available, the same shall be provided by the contractor. The scope includes the suitable POE surge Suppressor, STP Cat-6 cables, 12Mtrs MAT of triangular GI pipes, Network 9U rack, 24 Port POE based switch, Single ox i/o boxes, UTP cables and all consumables to complete the works.

2.58 CRITICAL SPARES:

Contractor shall supply below listed critical spares, which shall be used by MPA after completion of Guarantee period of two (2) years. The cost of these spares shall be included in the prices quoted by the bidder in the price bid. These are in addition to the start-up and commissioning spares, which shall be in contractor scope.

i) **Fire Fighting Pump Diesel Engine (Below spares shall be supplied for each Engine Type and model):**

a) Two sets of fuel filters, elements, and seals.

b) Two sets of lubricating oil filters, elements and seals.

c) Two sets of belts (where used)

d) One complete set of engine-joints, gaskets and hoses,

e) Two injector nozzles,

f) One complete set of piston rings for each cylinder,

g) One inlet valve and one exhaust valve

h) A standard kit of tools

ii) **Fire Fighting Pumps (Below spares shall be supplied for each Pump Type and model):**

a)	Impeller	1 set
b)	Pump Shaft	1 set
c)	Wearing Ring Suction	1 set
d)	Wearing Ring	1 set
e)	Gland	1 set
f)	Gland Packing	1 set
g)	Shaft Sleeve Suction	1 set

h) Shaft Sleeve Delivery 1 set

i) Bearing 1 set

iii) **Electrical:**

a) Contractor 1 no. of each rating

b) MV fuse 10% of each rating.

c) Overload relay with single Phasing preventer: 10% of each rating.

d) Indication lamps: 10% of total installed quantity

e) MCBs & ELCB: 10% of each rating for each item.

f) MCCBs: 1 no. of each rating.

iv) **Hydrant System:**

a) Spare Washer for Hydrant Valve Seat 5 Nos.

b) Hydrant Valve Seat 2 Nos.

c) Hydrant Valve Hand Wheel 2 Nos.

d) Hydrant Valve Blank Cap 2 Nos.

e) Motorized Valve actuator for each size and type of valve 1 set

f) Spray Nozzle minimum 5 Nos. of each type

g) Spare hose to the extent of 10% of BOQ qty.

h) Hose box Key 2 Nos.

i) Pressure Gauge of each type 1 Set

j) Pressure Switch of each type 1 Set

v) **Remote operated Foam cum Water Monitor:**

a) 'O' Ring for Swivel Joint Female Part 2 set

b) Rubber Washer for Swivel Female Part 1 set

c) Rubber Washer for Swivel Male Part 1 set

d) 'O' Ring for Swivel Joint Male Part 1 set

e) 'O' Ring for Orifice 1 set

f) 'O' Ring for Orifice 2 set

g) 'O' Ring for Dome 1 set

h) 'O' Ring for Dome 1 set

i) 'O' Ring for Sleeve 1set

j) 'O' Ring for Sleeve 1 set

k) 'O' Ring for Induction Body 1 set

l) Auxiliary & Power Contractors (3 Nos. each) MCBs 2 Set

m) Electrical Fuses HRC – NS – 2 3 sets

n) Indicator Lamps - LED – R: 02 Nos., Y: 01 No, Gr: 02 Nos. & B: 01 No. – 6 set

o) Terminal clip, suitable for 1.5 mm^2 , 2.5 mm^2, 6.0 mm^2, - 4 each. – 12 set

MORMUGAO PORT AUTHORITY

MECHANICAL ENGINEERING DEPARTMENT

BILL OF QUANTITIES

Note: The Contractor shall invariably supply all the quantities indicated in Bill of Quantities (BOQ) and any other additional required quantities of labour, materials and equipment as necessary which may not have been specifically mentioned herein or installed or noted in the tender Drawings/Documents as being furnished herewith, but which are necessary and customary to be performed under this contract, for satisfactory commissioning and operation of fire protection system, without any extra cost to MPA.

A.	Hydrants, Water/ Foam Monitors and Accessories		
1	Supply, Erection, Testing and Commissioning of Tower Mounted Long range Water Cum Foam Tower Monitors in SS316 construction. Tower mount Long range Water Cum Foam Monitor with Jet and Spray Arrangement Nozzle Remote Operated Made of SS316 material Flow 3000LPM @7kg/cm^2 UL Listed /FM Approved. 70Mtrs Horizontal through 340Deg rotation, The operation of tower monitor shall be remote controlled, electrically operated from control tower and from Local flame proof Control panel and with electrical /electro hydraulic equipment's for horizontal and vertical rotation.	2	Nos.
2	Supply, Erection, Testing and Commissioning of Water Cum Foam Ground Monitors in SS316 construction. UL listed Water Cum foam monitors shall include all fixtures, clamps, SS Fasteners, and flanged connection as per ANSI B16.5 150#. Monitor suitable to discharge 500 GPM of water at horizontal range of 60 m and vertical range 30 m or 500 GPM foam & water mixture with a horizontal throw range of 55 m and vertical range 25 m with hand wheel for horizontal and vertical rotation, with Manual operation control. MOC of Nozzle, Body, Elbow, Bend, Flange, shall be SS316.	1	No.
3	Supply, erection, testing and commissioning of Double Headed Standard Fire Hydrants (SS-316 size 63mm)		
	Hydrant valve Confirming to IS: 5290 Type - A, ISI marked (S.S 316) with two separate landing valve including 80mm dia. flanged inlet & 63mm dia. female outlet complete with cap and other accessories.		

i	Double headed hydrant valves	10	Nos.
ii	Single headed hydrant valves	4	Nos.
iii	Supply, erection, Testing and commissioning 80 mm dia. SS 316 with 3mm thick Orifice plates for Hydrant Valve	24	Nos.
4	SS Drum Swing Type Drum Hose Reel wall mounting with 1" isolation valve / 19MM rubber braided hose IS884 with SS316 Shut off Nozzle	4	Nos.
5	Supply, erection, testing and commissioning of External FRP hose cabinet stand/wall mounted type		
i	Fabricated out of FRP Body, 5mm thick & Door with 3mm thick Front Glass, (3 mm thick glass with rubber beading) door and size of cabinet shall be 900 mm x 750mm x 250mm , quoted rate shall include suitable stand for mounting, fasteners, Lock, Key, hammer etc. Hose Box shall be suitably marked on the outside with the letters "FIRE HOSE" including necessary locking arrangement	10	Nos.
6	Supply, erection, testing and commissioning of Internal FRP hose cabinet stand/wall mounted type		
ii	Fabricated out of FRP Body, 5mm thick & Door with 3mm thk. Front Glass, (3 mm thick glass with rubber beading) door and size of cabinet shall be 700 mm x 600mm x 250mm , quoted rate shall include suitable stand for mounting, fasteners, Lock, Key, hammer etc. Hose Box shall be suitably marked on the outside with the letters "FIRE HOSE" including necessary locking arrangement	4	Nos.
7	Supplying, installing, testing and commissioning of 63 mm dia. RRL Fire Hose of Type 3 (as per IS : 636) with SS316 coupling of 63 mm dia. and length 30 mtrs. as described below including SS 316 male and female instantaneous type coupling, suitable for burst pressure of min 35.7 kg/sq.cm. Hose shall be permaline hose and coupling to I.S.903-1975 with ISI certification, riveted to hose pipe with copper rivets & 1.5 mm copper wire.	28	Nos.
8	SS316 Orifice Plate for 100 NB Flange	14	Nos.
9	Supplying, installing, testing and commissioning of standard size SS316 Branch pipe with Triple purpose nozzle standard instantaneous type 63 mm dia. coupling as per IS 2871	14	Nos.
10	International Shore Fire Connection (ISFC) with accessories and valve Box 63mm MALE INST. Inlet Flange Connection of 14.5 mm Thick 178 mm O.D. & 132 mm PCD Having 4 Nos. 19 mm Dia. Spaced Equal Distance on PCD and Slotted to Flanged Periphery. 1. FRP box-Size-300 mm x 300 mm x300 mm – 1 No. 2. GI Bolt-Dia. 16 mm x 50 mm long – 4 Nos. 3. GI Nut- Dia-16 mm – 4 Nos. 4. GI washer- 8 Nos 5. Gasket (Material suitable for Sea water application.) – 1 No.	1	No.

11	Supply, erection, testing & commissioning of M S ERW Heavy (Class C) Pipe as per IS:1239 Part-1 for 150mm dia. and IS:3589 Gr. Fe. 410 for 200mm and above with internal Poly glass coated, including cutting, screwing, welding etc. and providing all fittings (thickness of fittings shall be matched with parents pipes) like elbow, tee, reducer, companion flanges, All fittings shall be A234 WPB. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	250 NB, Sch.40,ERW, IS 3589 with Poly glass coating., B.36.10	630	mtr.
ii	150 NB, Sch.40,ERW, IS 3589 with Poly glass coating., B.36.10	306	mtr.
iii	100 NB, Sch.40,ERW, IS 1239, with Poly glass coating	30	mtr.
iv	80 NB, Sch.40,ERW, IS 1239, with Poly glass coating	36	mtr.
12	Supplying, installing, testing and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Rising Spindle OS&Y Type Gate Valve having S.S. AISI Duplex SS Spindle, Gland Packing of Graphite Ring, Manually C.I. Hand wheel operated Conforming to API Standards. Flange ends drilled to ASME B-16.5 Class-150 R/F. The Valve Hydro tested to 24 Kg/ cm^2 for Body & 16 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	250 NB	6	Nos.
ii	150 NB	5	Nos.
iii	100 NB	11	Nos.
13	Supply, Installation, Testing, and commissioning of Gun Metal Non-Rising Spindle Type Globe Valve having G.M. Spindle, manually Hand wheel operated Conforming to IS: 778. BSP Female Screwed ends. The Valve Hydro tested to 24 Kg/ cm^2 for Body & 16 Kg/ cm^2 for Seat		
i	25NB	6	Nos.
14	Supplying , Installing, Testing and Commissioning of pressure gauges with siphon tube and cock, Glycerine filled, 150mm dial, range - 0 to 25 kg/cm^2 as per ,with isolation valve/cock including required all fixing accessories. MOC - SS316	6	Nos.
15	Supply, Erection, Testing and Commissioning of Motorised SS Duplex Gate Valve with Actuator. (For Jumbo Curtain ,Tower monitor)- 150 NB dia.	8	Nos.
	Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Rising Spindle OS&Y Type Gate Valve having S.S. AISI Duplex SS Spindle, Gland Packing of Graphite Ring, El. Actuator Flame Proof Operated with Manual override facility Conforming to API Standards. Flange ends drilled to ASME B-16.5 Class-150 R/F. The Valve Hydro tested to 24 Kg/cm^2 for Body & 16 Kg/ cm^2 for Seat.		

	a) MOV With Operating Voltage of 415 V AC 50 HZ and flameproof Enclosure with zone IIA/ II B application and 3-phase squirrel cage motor TEFC class F insulated (temperature rise limited to class B) both for motor and its terminal box, for outdoor duty, the motor shall be provided with anti-condensation heater. b) 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. Internal wiring shall be tropical grade PVC insulated, stranded copper conductor cable of 10A rating for control circuits and required rating for motor.		
16	M.S Platform and Pipe Supports including ISA, ISMC, M.S Plates, stiffener plate, u bolts, clamps etc. mounting fire protection accessories and crossing existing pipe line area as detailed in the tender piping drawing (kg) Painting for M.S platform as Epoxy Painting. Quoted Price including Structural Support from FGL and baseplate and Total Weight (Kg) of One M.S Platform	10	Tons
B	**Fire Pump room- Mechanical & Electrical works**		
1	Supply, Erection, Testing and Commissioning of Diesel Engine driven End suction Centrifugal pump suitable for rating mentioned below :	3	Nos.
	SITC of Diesel Engine driven End Suction Centrifugal type pump set (for Hydrant / Water Monitor / Water curtain / Tower Monitor / Spray system), Capacity : 660 cu. mtrs/hr @140 MWC at discharge flange complete with suitable diesel engine, fuel tank, base frame, coupling, coupling guard and all other accessories as required. Pump shall be able to deliver 150% of discharge with minimum 65% rated head with shut off not exceeding 140%. The pump, engine and accessories manufacturing and installation shall comply to OISD codes. Cost include First Fill of Fuel (Main Pump set). The pump set and its water contact parts shall be suitable for sea water application. (1) MOC of Pump - (a) Suction: Duplex SS, (b) Impeller : Duplex SS, (c) Shaft & Shaft Sleeve: Duplex (d) Bearing bush: Thordon (e) Sleeve, gland: Duplex, (f)Fasteners: SS316L, (g) Foundation bolts: SS316L, (h) Auto release valve: SS316L, (1) The Diesel Engine shall be complete with battery charger panel complete with boost and trickle charging facility, auto-manual selector switch, two sets of maintenance free Lead Acid Batteries, (Batteries to be of sufficient Ampere Hour to be adequate for 10 consecutive starts without recharging with a cold engine under compression) & battery with stand. 2) Pump shall be Gland packing and companion flanges (SS316L) shall be supplied with pump. 3) Engine: water cooled engine. 4) Pump shall be with self-lubrication. 6) Pump unit rate shall include all the		

	consumables, lubricants, first filling of diesel, coolant etc. 7)Pumps shall be provided with thermal insulation upto discharge level as per the existing design. 8) Fuel Oil storage tank with level indicator and level switch and suitable of 6 hr continuous Operation .		
2	Supply, Installation, Testing & Commissioning of Electric driven End Suction Centrifugal Jockey pump suitable for rating mentioned below capable of starting automatically and also manually.	2	Nos.
	SITC of Electrical driven End suction Centrifugal type Jockey pump set Capacity : 35 m^3/hr @140 MWC at discharge flange complete with suitable LT Motor , base frame, coupling, coupling guard and all other accessories as required. The pump, Motor and accessories manufacturing and installation shall comply to OISD codes.The pump set and its water contact parts shall be suitable for sea water application (1) MOC of Pump -(a) Impeller : Duplex SS, (b) Shaft: Duplex, (c) Shaft Sleeve: Duplex, (d) Bearing bush: Thordon (e) Rising (Column) Pipe: duplex, (f) Discharge bend: Duplex (g) Muff Coupling with collar etc.: duplex, (h) Sleeve, gland: Duplex, (i)Fasteners: SS316L, (j) Sole plate, Motor stool: M.S with epoxy coating, (k) Foundation bolts: SS316L, (l) Auto release valve: SS316L, 1) Motor Shall be Non-Flameproof having Suitable KW Rating @ 2950 Rpm, 2)Type: 3-phase squirrel cage motor TEFC class F insulated and IE2, 3) Motor Protection : IP 55 and above, 4) 30KW (bidder shall validate the same during the construction stage), 5) Operating Voltage : 415 V AC Supply @ 50 Hz		
3	Supply, erection, testing & commissioning of the following ERW steel pipe as per IS 1239 /3589		
i	450 NB, Sch.40,ERW, with Poly-Glass coating internal & external of 1000 micron	48	Mtrs
ii	150 NB, Sch.40,ERW, with Poly-Glass coating internal & external of 1000 micron	24	Mtrs
4	Supply, erection, testing & commissioning of the following ERW steel pipe as per IS 1239 /3589		
	SITC of Above ground M S ERW Heavy (Class C) Pipe as per IS:1239 Part-1 for 150mm dia & IS:3589 Gr. Fe. 410 for 200 mm dia and above with internal Poly glass coated, including cutting, screwing, welding etc. and providing all fittings (thickness of fittings shall be matched with parents pipes) like elbow, tee, reducer, companion flanges, All fittings shall be A234 WPB. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316 As per ASTM A 193 Gr.B7/194 Gr.2H		
i	450 NB, Sch.40,ERW, with Poly-Glass coating internal, B.36.10	12	mtr.
ii	350 NB, Sch.40,ERW, with Poly-Glass coating internal B.36.10	18	mtr.

iii	300 NB, Sch.40,ERW, with Poly-Glass coating internal B.36.10	12	mtr.
iv	250 NB, Sch.40,ERW,with Poly-Glass coating internal, B.36.10	18	mtr.
v	80 NB, Sch.40,ERW,with Poly-Glass coating internal	6	mtr.
5	Supplying, Installing, Testing and Commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Swing Type Non-Return Valve having Duplex Stainless Steel Hinge Pin, Conforming to BS: 1868. Flange ends drilled ASME B-16.5 Class-150 R/F. The Valve Hydro tested to 24 Kg/ cm^2 for Body & 16 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	450 NB	2	Nos
ii	300 NB	3	Nos
iii	80 NB	2	Nos
6	Supplying, installing, testing, and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Rising Spindle OS&Y Type Gate Valve having S.S. AISI Duplex SS Spindle, Gland Packing of Graphite Ring, Manually C.I. Hand wheel operated Conforming to API Standards. Flange ends drilled to ASME B-16.5 Class-150 R/F. The Valve Hydro tested to 24 Kg/ cm^2 for Body & 16 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
I	450NB	2	Nos.
ii	300 NB	3	Nos
iii	250 NB	7	Nos
iv	80 NB	2	Nos
7	Supply, Installation, Testing, and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Lift type Foot Valve having Rubber Moulded Disc Seat for 100% leak proof design with SS Strainer. Conforming to IS: 4038 P.N.0.2. Flange ends drilled to ANSI B 16.5. The Valve Hydro tested to 06 Kg/ cm^2 for Body & 02 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	450 NB	3	Nos
ii	150 NB	2	Nos
8	Supplying , Installing, Testing and Commissioning of pressure gauges with siphon tube and cock, Glycerine filled, 150mm dial, range - 0 to 25 kg/cm^2 as per ,with isolation valve/cock including required all fixing accessories. MOC - SS316	7	Nos.

9	Supplying, Installing, Testing and Commissioning of pressure switches with tubing, isolation valves. complete as per requirement steel plated.(Inside the Pump room) MOC - SS 316 , DPST Contacts	5	Nos.
10	Suppling , Fixing, commissioning of Electromagnetic Type Flow Meter complete with all accessories Flowmeter of size 250 NB (Flow - 1000 m^3/hr) having flow handling capacity of 150% of single pump discharge for test line Body - WCB , Flange 300# - with required accessories matching flanges, nuts, bolts gaskets etc.	1	No.
11	Providing & Fixing of 250NB Pressure Relief Valve, Flange end connection as per ASTM A 16.5 150#, with matching flanges, nuts, bolts, gaskets etc. whichever required as per site conditions.	1	No.
12	Providing & Fixing of Priming Tank 2000 Litres along with suitable Piping,	5	Nos.
13	MCC Panel- Supply, installation, testing & commissioning of Non-Flameproof Modular compartmentalized Motor Control Centre fabricated main body from 14 SWG CRCA sheet. The panel shall be dust and vermin proof, 415V 3Ph, 50 Hz as per IP 42 construction. The panel shall be powder coated with FIRE RED with 7 tank process for clearing and phosphating before powder coating. The panel should be with Suitable incomer & outgoing to meet the above mentioned pumps plus with required Star Delta starter and MCCBs CT, Voltmeter, Phase indicators, indication lamps, Aluminium bus bars with colour coded heat shrinkable insulating sleeves, All MCCB shall be suitable for motor duty application. Cost shall be inclusive of required fabricated angle support, earthing & required also. (as per site conditions it should be placed inside the pump room-indoor) - Vendor shall submit the GA/SLD drawing for review and approval.	1	No.
	Outgoing Feeder a) Control for Main diesel fire pump - 3 Nos b) 415 V Soft Starter for 37 KW motor rating for Jockey Pump - 2Nos c) 415 V AC outgoing Power Supply for Foam Pump MCC panel -1 No i) 230V AC feeder for pump house lighting - 2 Nos		
14	SITC of Diesel engine Non Flameproof Control panel with 2 set of battery charger , on/off push buttons, Hooter for all Diesel engine Fire Pumps with required control cables	3	Nos
15	SITC of Annunciation cum Remote Control panel (at Control Room) with on/off push buttons for all Fire water & foam Pumps with required control cables from Main panels. Foam and fire water pumps. Public address system with required 2-way connection from 4 locations	1	Set
C	**Sprinkler & Foam system with Accessories**		
1	Supply, testing & commissioning of Diesel Engine (Radiator cooled, 24 V DC) Driven Gear Operated Foam Supply Pump Set with engine of capacity 600 LPM at 16 kg/cm^2 with all accessories for transfer of AFFF	2	Nos.

	foam. The contractor should provide foundation arrangements to suit grouting and install the same as per client's requirement. MOC of PUMP casing, Rotor/Stator Gear, Rotor/Stator Shaft, Relief Valve shall be SS316.		
2	MCC Panel- Supply, installation, testing & commissioning of Modular compartmentalized Motor Control Centre fabricated main body from 14 SWG CRCA sheet. The panel shall be dust and vermin proof, 415V 3Ph, 50 Hz as per IP 42 construction. The panel shall be powder coated with FIRE RED with 7 tank process for clearing and phosphating before powder coating. The panel should be with Suitable incomer & outgoing to meet the above mentioned pumps plus with required Star Soft starter and MCCBs CT, Voltmeter, Phase indicators, indication lamps, Aluminium bus bars with colour coded heat shrinkable insulating sleeves, All MCCB shall be suitable for motor duty application. Cost shall be inclusive of fabricated angle support, earthing & required also. (as per site conditions it should be placed inside the pump room-indoor) - Vendor shall submit the GA/SLD drawing for review and approval.	1	No
3	SITC of Diesel engine Control panel with 2 set of battery charger , on/off push buttons , Hooter for all Diesel engine Fire Pumps with required control cables	2	Nos
4	Design, supply, erection and testing of SS-316L Inline Balance Pressure Foam Proportionating System consisting of proportioner, spool valves, foam concentrate valve, drain cock valves, duplex gauge, pressure gauge, check valves at foam concentrate inlet, water & foam sensing line, automatic concentrate control valve with flush connection complete in all respect and suitable for outdoor installation. (Capable for Flow Max – 11000 LPM with 0.5 max. bar pressure drop)	1	No
5	SITC of Above ground Seamless SS316L pipe as per ASTM-A-312, TP-316L, Schedule-20 including cutting, screwing, welding etc. and providing all fittings like elbow, tee, reducer, companion flanges, SS316 nut-bolt, washer(80-100micron galvanised)), EPDM gasket etc. as per ASTM-A-403, WP-316L, Schedule-20 / ASTM-A-182, F-316, Class 3000# and including structure supports like clamps, ISMC, ISA, Base plate, hanger, U-Bolt etc. and including cutting holes and chases in brick/RCC wall / slabs complete with External painting with SS pipes painting as per tender specification. The unit rate of pipe shall include the cost of fittings and painting.		
i	100 NB	12	Mtrs
ii	80 NB foam Pump Suction	6	Mtrs
iii	80 NB- Foam Pump Delivery and up to Propotioner assembly	18	Mtrs
iv	65 NB	6	Mtrs
6	Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) Double Flanged Rising Spindle OS&Y Type Gate Valve having S.S. AISI Duplex SS		

	Spindle, Gland Packing of Graphite Ring, El. Actuator Flame Proof Operated with Manual override facility Conforming to API Standards. Flange ends drilled to ASME B-16.5 Class-150 R/F. The Valve Hydro tested to 24 Kg/ cm^2 for Body & 16 Kg/ cm^2 for Seat.a) MOV With Operating Voltage of 415 V AC 50 HZ and flameproof Enclosure with zone IIA/ II B application and 3-phase squirrel cage motor TEFC class F insulated (temperature rise limited to class B) both for motor and its terminal box, for outdoor duty, the motor shall be provided with anti-condensation heater.b)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. Internal wiring shall be tropical grade PVC insulated, stranded copper conductor cable of 10A rating for control circuits and required rating for motor.		
i	100 NB	1	No
7	Supply, Installation, Testing and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) SS Strainer, Conforming to IS: 4038 P.N.0.2. Flange ends drilled to ANSI B 16.5. The Valve Hydro tested to 06 Kg/ cm^2 for Body & 02 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	100 NB	1	No
8	Supplying, Installing, Testing and Commissioning of pressure gauges with siphon tube and cock, Glycerine filled, 150mm dial, range - 0 to 25 kg/cm^2 as per, with isolation valve/cock including required all fixing accessories. MOC - SS316	1	No.
9	Providing and fixing a set of UL Listed SS316 MOC Medium Velocity spray nozzle (housing as per A351-CF8M) as per technical specification of Size 1/2" NPT, SS with required Spray angle. Each Nozzle body permanently marked with model number, batch number, spray angle, K-factor & UL mark	32	Nos
10	SITC of Above ground Seamless SS316L pipe as per ASTM-A-312, TP-316L, Schedule-20 including cutting, screwing, welding etc. and providing all fittings like elbow, tee, reducer, companion flanges, SS316 nut-bolt, washer (80-100 micron galvanised), EPDM gasket etc. as per ASTM-A-403, WP-316L, Schedule-20 / ASTM-A-182, F-316, Class 3000# and including structure supports like clamps, ISMC, ISA, Base plate, hanger, U-Bolt etc. and including cutting holes and chases in brick/RCC wall / slabs complete with External painting with SS pipes painting as per tender specification. The unit rate of pipe shall include the cost of fittings and painting.		
i	100NB	24	Mtrs

ii	50NB	66	Mtrs
11	Flame Proof Local control panel of Die-Cast Aluminium construction with Push button and indication lamp for valve Operation	1	No
12	Structural supports including ISA, ISMC, M.S Plates, stiffener plate, u bolts, clamps etc. for piping and cable tray inside pump house complete with corrosion protection as per tender Specifications	200	KG
13	Alarm valve. -UL listed & FM approved MOC-Suitable for Sea Water with all Accessories variable trim kit		
i	100 NB	1	No
14	Supply, Installation, Testing and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) SS Strainer, Conforming to IS: 4038 P.N.0.2. Flange ends drilled to ANSI B 16.5. The Valve Hydro tested to 06 Kg/ cm^2 for Body & 02 Kg/ cm^2 for Seat. All flanged valves shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	100 NB	1	No.
15	Supplying , Installing, Testing and Commissioning of pressure gauges with siphon tube and cock, Glycerine filled, 150mm dial, range - 0 to 25 kg/cm^2 as per ,with isolation valve/cock including required all fixing accessories. MOC - SS316	1	No.
16	Providing and fixing a set of UL Listed SS316 / BRASS MOC Sprinkler nozzle K-80 as per technical specification of Size 1/2" NPT,	32	Nos
17	SITC of Above ground Seamless SS316L pipe as per ASTM-A-312, TP-316L, Schedule-20 including cutting, screwing, welding etc. and providing all fittings like elbow, tee, reducer, companion flanges, SS316 nut-bolt, washer(80-100micron galvanised)), EPDM gasket etc. as per ASTM-A-403, WP-316L, Schedule-20 / ASTM-A-182, F-316, Class 3000# and including structure supports like clamps, ISMC, ISA, Base plate, hanger, U-Bolt etc. and including cutting holes and chases in brick/RCC wall / slabs complete with External painting with SS pipes painting as per tender specification. The unit rate of pipe shall include the cost of fittings and painting.		
i	100NB	24	Mtrs
ii	50NB	66	Mtrs
18	Structural supports including ISA, ISMC, M.S Plates, stiffener plate, u bolts, clamps etc. for piping and cable tray inside pump house complete with corrosion protection as per tender Specifications	200	KG
19	Supply, Installation, Testing and commissioning of Duplex Stainless Steel (ASTM A890 GR. 5A-CE3MN) SS Strainer, Conforming to IS: 4038 P.N.0.2. Flange ends drilled to ANSI B 16.5. The Valve Hydro tested to 06 Kg/ cm^2 for Body & 02 Kg/ cm^2 for Seat. All flanged valves		

	shall be as per ASME B 16.20 and all gaskets shall be of metallic with SS316 spiral wounded CAF filler. All studs and nuts shall be SS 316.		
i	150 NB	1	No.
20	Supplying , Installing, Testing and Commissioning of pressure gauges with siphon tube and cock, Glycerine filled, 150mm dial, range - 0 to 25 kg/cm^2 as per ,with isolation valve/cock including required all fixing accessories. MOC - SS316	1	No.
21	Water curtain nozzles in SS 316 construction, capacity K-58 at 110 lpm screwed end UL Listed / FM approved	18	Nos
22	SITC of Above ground Seamless SS316L pipe as per ASTM-A-312, TP-316L, Schedule-20 including cutting, screwing, welding etc. and providing all fittings like elbow, tee, reducer, companion flanges, SS316 nut-bolt, washer(80-100micron galvanised)), EPDM gasket etc. as per ASTM-A-403, WP-316L, Schedule-20 / ASTM-A-182, F-316, Class 3000# and including structure supports like clamps, ISMC, ISA, Base plate, hanger, U-Bolt etc. and including cutting holes and chases in brick/RCC wall / slabs complete with External painting with SS pipes painting as per tender specification. The unit rate of pipe shall include the cost of fittings and painting.		
i	150NB	18	Mtrs
ii	80NB	36	Mtrs
23	Structural supports including ISA, ISMC, M.S Plates, stiffener plate, u bolts, clamps etc. for piping and cable tray inside pump house complete with corrosion protection as per tender Specifications	250	KG
24	Portable Equipment's		
i	Jet nozzles with branch pipe as per IS:903	4	Nos.
ii	Fog nozzles pipe as per IS:952	4	Nos.
iii	Universal nozzles as per IS: 2171	4	Nos.
iv	Foam branch pipe as per IS:952	4	Nos.
v	Sand Scoops	4	Nos.
vi	Safety helmets	10	Nos.
vii	Portable Water curtain nozzles	2	Nos.
viii	Stretcher	2	Nos.
ix	First Aid Box	2	Nos.
x	11 KVA rubber hand gloves	2	Nos.
xi	Portable Explosive meter	1	Nos.
xii	Fire Proximity suit	2	Nos.
xiii	Resuscitator	2	Nos.
xiv	Electrical siren (1 km range)	1	Nos.

xv	Hand operated siren	1	No.
xvi	Water jet blanket	2	Nos.
xvii	Positive Pressure type self-contained breathing apparatus with spare cylinder	2	Nos.
xviii	Clean Agent Modular Extinguisher 4 kg	2	Nos.
D	**Control Panel for Tower monitors, Instruments. Fire & Gas detection and Alarm system, CCTV system**		
1	SITC of Pressure Switch in SS316 enclosure with SS316 internals, range 0-25kg/cm^2 with three way valve manifold of SS construction and all other accessories & SS pipe tubing.	4	Nos.
2	SITC of Pressure Gauge, Bourdon type, Case- Die cast aluminium with polyethylene paint, movement - Ph bronze, wetted parts - brass, 150mm dial, Range 0 - 25 Kg/cm^2, accuracy - +/- 1%.	4	Nos.
3	SITC Level Switch (For Foam tank)Capacitance type, Enclosure - Die cast aluminium with polyethylene paint Electrode - SS316, Insulation on electrode - PVDF, Process connection - SS304.	2	Nos.
4	SITC of Local Push Button Stations with start, stop PB, local/remote switch, auto/manual switch & ammeter	2	Nos.
5	SITC of A351GR.CF8M (SS316) Gate valve, Rising Spindle type with indication of close / open positions, class 300,as per API Standards including SS companion flanges, gasket, SS 316 nut-bolt & washer as per specification.		
i	100 NB	2	Nos.
ii	80 NB	7	Nos.
6	SITC of A351GR.CF8M (SS316) Non Return valve (bolted cover) Swing check type, as per API Standards, class 300 including SS companion flanges, gasket, nut-bolt & washer as per specification.		
i	80 NB	2	Nos.
7	SITC of Casting Strainer of SS 316L, including SS companion flanges, gasket, SS 316 nut-bolt & washer as per specification. End connection as per ANSI B 16.5 Class 150		
i	80 NB	2	Nos.
8	SITC of Stainless steel SS 316L Pressure regulating valve including companion flanges, gasket, SS 316 nut-bolt & washer as per specification.		
i	40 NB	2	Nos.
9	SITC of Rectangular type Pressure relief valve of SS 316L (Range 14-20 kg/cm^2) of size 40 NB including all fixing accessories.	1	No.
10	SS 316 drain valve -40 NB/25 NB for foam storage tank , Suction and delivery manifold	2	Nos.

11	Supply, erection and testing of Remote Operated Control Panel-Fabricated type Design, Supply, Installation, Testing and Commissioning of remote operated control panel for following systems.a) Tower monitors- 2no's b) MOV's (for Jumbo Curtains, Tower monitors, MVWSS, Water Curtain)-8 No'sThe control panel used to Control & Operation of ROM & MOV for ROM & Water Curtain system consisting of ,FORWARD, REVERSE, LEFT, Right, Jet & Fog Push Buttons from control room located at 4th floor. The control panel shall have indication lamps. The supporting MS stand shall be provided, Made of hard MS sheet with not less 2mm thickness etc. to complete the works. with required Ar. Fire Survival cables from field devices to control panel (1500Mtrs),	1	No.
12	Design, Supply, Installation, Testing and Commissioning of Flame Proof Local control panel of Die-Cast Aluminium construction for Control & Operation of Tower Monitors & MOV for ROM & Water Curtain system consisting of ,FORWARD, REVERSE, LEFT, Right, Jet & Fog Push Buttons, SS316 , Explosion proof with double compression flameproof glands, suitable for installation in zone IIA/IIB classified area. with required Ar. Fire Survival cables from field devices to control panel (150Mtrs),	4	Nos.
13	Supply, Installation, Testing and commissioning of Explosion proof Junction box of Die-cast Aluminium construction complete with all required fixing accessories as per E&I Specification. (JB shall be suitable for installation in zone IIA / IIB classified area.)	4	Nos.
14	Supply, Installation, Testing, and commissioning of 6C OFC Ar. FS cable with terminations.	3000	Mtr
15	Supplying, laying, testing and commissioning of 1100 Volt grade Armoured Fire Survival cables between Local control panels to Existing MOV's, the scope of work to establish the required communication between Local control panel to Field devices to operate as required during the fire conditions with required accessories.		
i	3Cx2.5Sq.mm XLPE Insulated Power cables	300	Mtr
ii	3Cx1.5Sq.mm XLPE Insulated Power Cables	300	Mtr
16	Supplying, laying, testing and commissioning of Perforated type cable tray with necessary bands, tees and clamps for fixing. All material shall SS 316. Cable Trays shall be considered with Double Coupler Plates. All Bolts shall be SS 316 .Thickness of the cable tray material shall be 6 mm for 300 mm & above & 4 mm for below 300 mm size.		
i	300mm	1500	Mtrs
17	Structural supports including ISA, ISMC, M.S Plates, stiffener plate, u bolts, clamps etc. for piping and cable tray complete with corrosion protection as per tender Specifications.	5000	Kgs
	Fire Detection And Alarm System		

18	Addressable Fire Alarm Panel 2 Loop with local Display and Battery Backup FM approved/UL Listed	1	No.
19	Addressable Multi criteria (Heat +smoke) Detector with base and junction box for pump house building	20	Nos
20	Addressable MCP with JB for Pump House Building	4	Nos.
21	Conventional Hooter with Flasher	2	Nos.
22	Conventional Flame Proof MCP break Glass Type IP65 with SS316 Double Compression gland and Mounting MS stand support	8	Nos.
23	Monitor Module for Above Conventional Flame Proof MCP with Flame Proof Junction Box and SS316 double compression gland	8	Nos.
24	Conventional Hooter Flame Proof for Jetty area with MS support and stand with epoxy painting	3	Nos.
25	Addressable Relay Monitor for above Jetty Hooter with Flame Proof hooters and double compression glands	3	Nos.
26	Flame Detector UV/IR UL Listed or FM Approved	2	Nos
27	2CX1.5 Sq. mm Fire Survival Cable Armoured for Jetty Area MCP	1200	Mtrs
28	2CX2.5 Sq. mm Fire Survival Cable Armoured for Jetty Area Hooter	800	Mtrs
29	Supply & Fixing of Perforated type cable tray with necessary bands, tees and clamps for fixing. All material shall be GI. Cable Trays shall be considered with Double Coupler Plates. All Bolts shall be SS 316 .Thickness of the cable tray material shall be 6 mm for 300 mm & above & 4 mm for below 300 mm size.		
i	150 mm	1000	Rmt
	GAS Detection And Alarm System		
30	Hydrocarbon Gas Detector Infrared Point Type PESO Approved 0-100% LEL with Mounting Stand	4	Nos.
31	Toxic Gas Detector for Ammonia with Mounting Stand PESO Approved	2	Nos.
32	GAS detection Control Panel-16 zones	1	No.
33	Cable for Above Gas Detector 4CX1.5 Sq, mm. FRLS Armoured XLPE	1200	Mtr.
34	Supply & Fixing of Perforated type cable tray with necessary bands, tees and clamps for fixing. All material shall be GI. Cable Trays shall be considered with Double Coupler Plates. All Bolts shall be SS 316. Thickness of the cable tray material shall be 6 mm for 300 mm & above & 4 mm for below 300 mm size.		
i	150 mm	1000	Rmt
	CCTV SYSTEM		
35	Atex approved cameras PTZ 360Deg 30X Flame proof enclosure 150Mtrs range pan, tilt and zoom from remote location, SS316 pole 5Mtrs height, Media converter with FLS JB & Power socket.	3	No.

36	8Ch NVR with Preloaded software latest version Embedded type. 90day recording @720P.	1	No.
37	8P Network switch 4SFP preloaded + 4SFP Spare L3 type 1GB.	1	No.
38	24P Network switch 4SFP preloaded + 4SFP Spare L3 type 1GB.	1	No.
39	72inch or higher size larger screen Full HD video quality wall mount type and accessories.	2	No.
40	6C OFC Ar. FS cable with terminations	1200	Mtrs
41	Cat-6 FS Ar. Cable with terminations	400	Mtrs
42	12P Preloaded LIU box	1	No.
43	Workstation 500GB SSD, 16GB RAM, 8MB cache memory, 5000X speed key board, and mouse USB 3.0, HDMI etc. 32 inch monitor.	1	No.
44	3Cx2.5Sq.mm Power cable-Ar. FS type with cable tray	1200	Mtrs
45	Cable Tray GI with Cover	1000	Mtrs
E	**Civil and electrical works**		
1	Design, Supply, Installation, Testing and Commissioning of 20Mtrs height MS Tower Structure For Tower Monitor TW-1 & 2 with access Ladders (Ladder shall be staircase type). Cost including civil foundation works. The tower shall be applied with fire paint UL listed for 2hr fire rating, Min. 7mm thick. The civil work shall also include works like excavation, back filling, foundation works etc and operating platform, staircase with hand rail. Contactor to furnish the foundation drawings for prior approval. The Tower Structure for Tower Monitor assembly shall be designed to resist the nozzle reaction force experienced during the operation of the monitor.	2	Nos.
2	Civil Foundation for Fire Fighting Pumps & Jockey Pump & foam pumps, hose box, etc.	25	Cu.M.
3	For 250 NB Pipe Double Pipe Support (RCC civil foundation height 300/400 mm from above FFL)	20	Nos.
4	Design, Supply & Fixing of GALVALUME ROLLING SHUTTERS, 4Mtrs height 3M wide, Worn wheel drive handle for operation, 2mm thickness Sheet with required civil work to fix in the pump room. Epoxy paint.	1	Nos.
5	Dismantling of existing Two tower monitor structures along the removing of tower monitors with associated valves and connections etc.	1	Lot
6	Dismantling of 250mm dia. pipelines approx.		
7	Removing of existing damaged hose boxes, hydrant valves as accessories.		
8	Removing of existing 6 pump sets along the all valves, pipes, cables and other accessories etc.		
9	Removing of foam pumps and associated pipes and valves etc.-2 sets		

10	Removing of and reroute of existing power and communication cables the cable tray and supports.		
11	Removing existing DG set and related pipes and cables and panel-1 set		
12	Removing of existing shutter and clear the access path.		
13	Supply, Installation, Testing and commissioning of DG Set 100KVA with roof sheet, suitable of marine application. Engine MOC-Duplex, Radiator cooled with exhaust piping, the exhaust pipe shall be insulated as per existing design.	1	No.
14	Design, supply, installation, testing and commissioning of DG AMF synchronise panel suitable for above mentioned DG set with automatic change over between two sources made of 2mm sheet and main change over switch shall have 150% rating	1	No.
15	Supply & Fixing of Power cables between DG set and AMF panel-Ar. FS AL cables XLPE 3Cx150Sq,mm or higher to support the DG set KVA rating	100	Mtrs
16	Supply & Fixing of following power cables XLPE Ar. Type AL with Flame proof JB and double compression SS 316 glands		
i	3Cx150Sq.mm Between LT panel to fire water MCC panel	40	Mtrs
ii	3CX 50Sq.mm Between LT Panel to Foam MCC Panel	40	Mtrs
iii	3Cx 35Sq.mm Fire Water MCC to Fire Water Jockey pumps	40	Mtrs
iv	3Cx1.5Sq.mm Cu. Ar. Cable Pump House Lightings with FLP JB / CCTV System / FACP	300	Mtrs
v	12 C x 2.5 sq. mm Cu Conductor, FRLS armoured as Control Cabling for diesel engine	100	Mtrs
vii	2 C x 1.5 sq. mm Cu. Conductor, FRLS armoured cable for Instrumentation complete	240	Mtrs
17	G.I. Earthing strips of suitable size shall be run on floor / ceiling / walls, from the equipment to the nearest earth pit (Existing- location to be identified at site) with necessary accessories as required. (50 X 10 mm) for MCC panels and Motors (Including All the field panels)	1000	Mtrs
18	Supply & Fixing of Perforated type cable tray with necessary bands, tees and clamps for fixing. All material shall be GI. Cable Trays shall be considered with Double Coupler Plates. All Bolts shall be SS 316 .Thickness of the cable tray material shall be 6 mm for 300 mm & above & 4 mm for below 300 mm size.		
i	300 mm	2000	Rmt
ii	150 mm	2000	Rmt
iii	100 mm	300	Rmt
iv	50 mm	300	Rmt

19	Design, Construction of Industrial Earth pit for all electrical items with in the berth-8, the scope is to provide the required suitable civil works and labours, the designing of earth pit shall be as per IS-3043 code-the suitable location shall be identified at site near the pump room.	1	No.
20	Design, Supply & Fixing of l marine application Lightening arrestor at top of the pump house with required fittings, base plate and capacity of arrestor shall be suitable for site conditions and required cables etc. to complete the job.	1	No.
21	Selection, Supply & Fixing of FLP Light fixtures with FLP JB 15W CFL Tested for GAS GROUP-IIA , IIB & IIC and required accessories for installation.	8	Nos.
22	Control room shall be modified to clear sitting arrangement with provision of air conditioning and drinking water.	1	Lot
23	Pump room shall have clear ventilation, lighting, fire door and wide entry access.	1	Lot
F	**QRMHS Mooring system**		
1	Design, Selection, SITC of Single operated Single/quadruple Arm Quick Release mooring hook system, explosion proof, marine application, higher side holding capacity, designed as per ABS rules, with required civil foundation works, hand release switch provision, bidder to visit the site and take the required inputs and supply the QRMHS accordingly. The system shall have remote operation provision from control room to release the mooring hooks, the scope is to consider all required materials, civil works, labours etc. to complete the job.	2	Nos.
G	Critical Spare for fire protection system as specified in clause no:5.5.55	1	Lot
H	**Fire System pipe lines Pressure Monitoring station**		
	Supply & Installation of Pressure monitoring station to monitor the fire system hydrant & Tower monitors remote pressure at control room (4th floor) and pump room, a digital display shall be provided in respective locations, when if the set pressure drop down by 20% then a local alarm shall be generated, all provisions, cables instruments, FLP boxes power points shall be considered.	2	Nos.
I	Supply and Installation of '300Mbps or more wireless bridge for LAN and Telephone connectivity' for connecting MPA head office building to firefighting pump house building, remotely, including supply of POE surge Suppressor, STP Cat-6 cables, 12Mtrs MAT of triangular GI pipes, Network 9U rack, 24 Port POE based switch, Single ox i/o boxes, UTP cables and all consumables to complete the works.	1	Set

J	Design, Supply, fixing and commissioning, testing of Digital screen with required back-end controllers to monitor the DG sets carbon emission and sound level, all items shall be SS316L or suitable of marine applications. Required cabling between the DG sets and controller. fixed outdoor flue sensors required to measure the carbon level, total Engines 4 no's.	1	Set
K	Supply, Installation, testing and commissioning of Foam filling motor operated pump of capacity 50lpm, SS316L construction with required valves, SS piping from pump to foam tanks, control panel etc complete the work.	1	Set
L	Design, selection, supply, installation and testing of External light fixtures to cover the entire berth to give min illumination level of 25Lux and for fire fighter to take the action, the scope including all materials, cables, conduits, associated works, supporting poles etc to complete the job. The control panel shall be kept inside the Pump room with all cabling terminations.	1	Set

ANNEXURE – IV

Specifications of existing equipment installed inside the pump house

1. Existing Port Facilities:

The Berth no.8 at MPA has 3 nos. Ground Monitors, 6 nos. Double Headed Fire hydrants and 6 nos.Jumbo curtain nozzles with motorized valve and orifice plate at oil Berth No.8 of Mormugao Port to provide salvaging operations in case of any fire at the berth. The sea water and foam solution is being used as a Fire deterrent. The details of firefighting equipments installed at Berth No. 8 is detailed below:-

a) Remote operated Ground Monitor:

3 nos. Ground monitor capable of discharging 5000 LPM capacity at 12.25 Kg/cm^2 with a horizontal throw range of 75 meters with horizontal and vertical rotation and with base operation control and remote operation control.

b) Double Headed Hydrant :

6 nos. Double Headed Fire hydrants are capable of discharging flow of 900 LPM @ 7.5 kg/cm^2 oneach head. The Hydrants are situated at a Height of about 1.5M above the Ground level with orificeplates and provided below each hydrant and separate controls fitted with 63 mm instantaneous femalecoupling on each outlet complete with 2 Nos. hose box with stand of 15 m long hose pipe each withend coupling with nozzles.

c) Jumbo Curtain Nozzles :

6 nos. Jumbo curtain nozzles are with motorized valve and orifice plate, which are capable to produce dense water curtain of 20-meter radius, through 180 degree angle in vertical plane discharging at 250 LPM at an inlet pressure of 7 Kg/cm^2.

d) Specifications of Fire Pumps & Drive Engines

Equip-ment	**Qty.** (Nos.)	**Water Pump Model**	**Capacity (LPM)**	**Water Pump Pressure** (Kg/cm^2)	**Drive Engine Model**	**Drive Engine Make**	**Drive Engine HP**	**Drive Engine RPM**	**Foam Ratio**
Hydrant	2	Beacon	11000	16	VTA-1710-F1	Cummins	650	1900	—
Monitor	2	Beacon	6500	10.5	NT-743-F	Cummins	255	2100	—
Foam	2	Rotodel	600	18	HA-494	Kirloskar	52	1500	6%
DG Set	1	—	100 KVA	—	NT-495-G	Cummins	127	1500	—
Jockey Pump	2	Beacon	510	7	Motor driven	Motor 415 V	Motor 20 HP	Motor 2900 RPM	—

NOTE:

1. The above-mentioned pump house equipments were installed in the year 1996. However, Ground monitors, Hydrants, Jumbo curtains and the connecting pipelines (discharge side) were replaced in the year 2018.
2. Presently, 1 no. Ground monitor, 4 nos. Double Headed Fire hydrants and 4 nos. Jumbo curtain nozzles are out of operation.