DESIGN, ENGINEERING, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF AUTOMATIC FIXED CENTRALIZED FOAM FEEDING SYSTEM FOR REMOTE / PORTABLE / MANUAL HVLR MONITORS, MEDIUM EXPANSION FOAM FLOODING GENERATORS ETC. AT MARKETING TERMINALS / INSTALLATIONS / DEPOTS

Created By – Vimal Fire Controls Pvt. Ltd.

1.0 SCOPE:

This specification covers design, preparation of detailed engineering documents and drawings, manufacture, calibration & testing, inspection at contractor's works, packing, forwarding, supply of material, transportation, transit insurance, delivery at site, erection, installation, testing, commissioning at site and carrying out performance / acceptance tests of the equipment, materials and services as per enclosed specification, data sheets and other documents for automatic fixed centralized foam feeding system suitable for remote / portable / manual HVLR monitors, MEFFG, etc at marketing terminals / installations / depots.

2.0 OBJECTIVE:

The overall objective of the system is to feed foam compound to remote / portable / manual HVLR monitors, MEFFG, etc continuously without any stoppage thereby making the fire fighting operation effective and simultaneously alerting the personnel at the facilities so that they can respond to the incident.

3.0 APPLICABLE CODES AND STANDARDS

a) OISD standards (latest edition)
b) NFPA 11: Standard for low expansion Foam
c) Factories Rules – for applicable states.
d) Indian Electricity Rules
e) Bureau of Indian Standards
g) ASME Standards
i) Petroleum Explosives and Safety Organizations (PESO) Rules
j) UL / FM / VdS / LPCB
k) Any other applicable codes and standards

Where edition number of standards referred are not indicated, latest editions shall apply.

4.0 SYSTEM DESCRIPTION

The system shall consist of 2(two) mother tanks each of 50% capacity (total 100%). The capacity of the mother foam tanks shall be such that it shall be able to provide foam concentrate for total 50 minutes of foam feeding. The system shall be designed in such a manner that when mother tank No. 1 (one) is delivering foam to the foam network, provision for online foam feeding to mother tank No 2 (two) shall be provided.

3 (three) electrical pumps of desired capacity (2 working + 1 standby) for feeding foam from the mother foam tank to the daughter foam tanks shall be installed near the mother foam tanks. One individual daughter tank shall be installed to feed foam to remote /

portable / manual HVLR monitors and MEFFG. The daughter tanks shall be designed for 15 minutes of foam feeding, thus complying OISD requirement of 65 minutes (50 minutes by mother foam tank + 15 minutes by daughter foam tank).

The mother foam tanks shall be connected to the daughter foam tanks by a network of pipelines of desired size and valves arrangement.

The foam feeding operation shall be automatic as below:

A) Remote / Portable / Manual HVLR Monitor – As soon as the MOV / automatic valve of the HVLR Monitor will be opened, simultaneously Electrically Operated Valve / MOV on outlet of respective Daughter tank shall open, the open command signal shall be retransmitted to the foam system panel. The valve shall open and start delivering foam concentrate to nozzle / ratio controller / JRCP. Each daughter tank shall be meant to feed foam concentrate for a period of 15 minutes. Level switches shall be provided in the daughter tanks to automatically start and stop the filling of foam.

B) MEFFG shall be operated by manual valve. Common daughter tanks can be used for feeding of MEFFG and Remote / Portable / Manual HVLR Monitor. However separate foam lines shall be provided for each of the equipments for ease in identification and maintenance of the system.

C) The foam network connecting mother foam tank, daughter tank and all equipments coming in contact of foam shall be of Stainless Steel material.

D) The mother foam tanks shall be provided with automatic delivery valves and delivery pumps. As soon as signal from the daughter tank of low level is generated in the daughter tank, at the foam system panel in control room, a start command shall be given to the foam pump and the delivery valve of the mother foam tank to open. The foam pump shall start delivering foam concentrate to all the daughter tanks of which the corresponding signal are generated of the monitor in operation. The total capacity of the 2 foam pumps shall be so designed that it is able to fill foam concentrate to all the daughter tanks in the loop. Sizing calculation for the pumps shall be submitted along with the technical bid. Bidder’s offer shall be outright rejected in case this sizing calculation is not submitted with the technical bid. Upon daughter tanks getting filled, the foam pump shall get Level High signal from the daughter tank to panel and pump should stop automatically

E) Synchronous operation of both the mother foam tanks shall be achieved automatically by level switches / transmitter installed in the mother foam tanks. When one tank would be empty, the other tank should start delivering foam. Empty mother tank shall automatically start getting filled from the foam bank through sump.

F) Control panel shall be provided at main control room. The panel shall be provided with graphic representation on real time basis.

5.0 BROAD SCOPE OF WORK:

This section covers the broad requirements for design, engineering, supply, installation, testing & commissioning of automatic fixed foam feeding system for Remote / Portable / Manual HVLR monitors, MEFFG etc. as below:-

a) Complete design and engineering of the foam feeding system as per guidelines laid down in the tender documents.

b) The Bidder shall be capable of demonstrating the entire functioning of the system consisting of at least one mother tank, daughter tank, foam pump, foam feeding arrangement for HVLR monitor, medium expansion foam generator, SCADA software (graphics) along with PLC based control system. Bidder shall have to arrange at Bidders work or any location acceptable to the committee nominated by IOCL within 07 days of opening of techno commercial bid. No extension shall be provided to Bidder towards demonstration. Successful demonstration is an essential pre-requisite for technical qualification in the tender.

c) Civil Works:- Supply of all civil material, construction of foundation for mother foam tank, daughter foam tanks, foam pumps, foam sump for foam filling of mother foam tank, pipe support etc. Existing cable tray supports and civil supports are to be used for laying cables for Power, Signal and Foam lines. Bidder to provide additional structural bracket for using existing supports, if required.

d) Mechanical Works: Supply and erection of mother foam tank, daughter foam tank, piping network and other allied work.

e) Electrical Works: Supply and installation of all cabling, panels, interconnection of field equipments, pump connections, motor starters etc.

f) Instrumentation Works: Supply and installation of all field instruments like pressure transmitters and switches, level transmitters and switches, automatic open / close valves, Electrically Operated Valve / MOV s and all other instrumentation works required for complete system.

g) Software: Supply and installation of HMI based graphic work station with dedicated foam feeding system software for operation and control of the foam system. The software shall be capable of providing live status of Foam concentrate inside foam tanks to keep inventory of foam concentrate. Real time status update of the operation of the foam feeding system over iOS / Android / cell phone application to 5 users should also be provided.

h) Design of the foam feeding system based on the specifications mentioned herein, OISD standards and as per site requirement shall be in Bidder's scope. Bidder shall provide basic design engineering, drawings, calculations of capacity of mother foam tank, daughter foam tank, pipeline size etc. along with the technical bid for evaluation of their bid. Non submission of above technical documents along with the technical bid shall lead to outright rejection of the offer.

i) Development of P&ID based on site requirement shall be in Bidder's scope. P&ID shall be submitted along with technical bid for evaluation by owner. Failure to submit the document along with technical bid shall lead to outright rejection of offer.

j) The system so provided by the Bidder shall be compatible with Automatic Fire detection system, which corporation shall be procuring at an future date. The output signal from such detection system shall be able to operate the system automatically without any intervention of human being. Bidder to confirm the same.

6.0 DETAILED SCOPE OF WORK:

This section covers the minimum scope of work for design, engineering, supply, installation, testing & commissioning of automatic fixed centralized foam feeding system for Remote / Portable / Manual HVLR monitors, MEFFG, etc. The detailed scope of work shall majorly consist of the following:-

6.1 DESIGN AND ENGINEERING

(a) Detailed design and engineering of site specific automatic foam feeding system based on the site layout, tank farm location, placement of Remote / Portable / Manual HVLR Monitors, MEFFG, etc. as per the tender documents and inline with latest OISD Stds.

(b) Design & Engineering of entire civil foundation and support of foam tanks, canopies, pipelines, valves etc.

(c) Design and Engineering of mother foam tanks, daughter foam tanks, pipeline network for foam feeding system.

(d) Development of P&ID for the total system

(e) Preparation of data sheets for all equipments including control valves, pressure transmitters, pressure switches, level transmitters, level switches, PLC, panels etc.

(f) Design and Engineering of entire cable layout including cable scheduling.

(g) Preparation of Functional design specifications for the foam system software. The software shall be capable of providing live status of Foam concentrate inside foam tanks to keep inventory control of the entire foam quantity of the terminal as a minimum requirement

(h) Prepare and submit as-built drawings in hard and soft copies to OWNER.

(i) All drawings shall be approved by OWNER or OWNER appointed consultant.

6.2 SUPPLY AND SERVICES

a) Construction and erection of foam tank foundation and canopy.

b) Supply, installation, testing and commissioning of mother foam tanks.

c) Supply, installation, testing and commissioning of aboveground foam piping, valves, valve chambers and specialties from foam containers (Foam containers supplied by OWNER) to foam transfer pumps, foam transfer pumps to foam storage tank, foam storage tanks to foam pumping skid, interconnected piping in foam pumping skid, foam network as per layout from foam pumping skid and further connections to Nozzle / ratio controller / JRCP of HVLR monitors, MEFFG etc. Use of UL listed fire safe gaskets in between flanges is mandatory for all flange joints. Bidders to provide details of such fire safe gaskets.

d) Supply, installation, testing and commissioning of foam transfer pump with drive (FLP motor), electric cables, accessories and necessary piping, valves & specialties.

e) Supply, installation, testing and commissioning of foam pumping skid including 2W + 1S pumps with drives (FLP motor) with accessories and necessary cabling from specified MCC room, piping, valves and specialties, pressure relief valve

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f) Motor Operated Valves (MOV) along with Push button, push button panel, motor control unit and necessary wiring for operation of foam feeding system. Cabling from specified MCC room to respective MOV’s

g) Supply, installation, testing & commissioning of daughter foam tanks near each HVLR and MEFFG

h) Manifold shall be provided at the outlet of the daughter tank for connecting of portable HVLR monitor wherever applicable.

i) Supply, installation, testing and commissioning of the various instrumentation items for field, like pressure switches, level switches, pressure and level transmitters, Electrically Operated Valve/ MOV's, auto actuation valves.

j) Supply, installation, testing and commissioning of draining system for foam line during routine maintenance / completion of fire fighting operation.

k) Supply, installation, testing and commissioning of all control panels in control room, for monitoring and control of the foam feeding system.

l) Supply, laying, glanding & termination of power, control & signal cables from field equipments to control room / power supply.

m) Supply, erection testing & commissioning of uninterrupted power supply system for the control panel. UPS shall be designed to provide uninterrupted power to the control panel for a period of 90 minutes in case of mains power failure. UPS shall be of single phase. Sizing of the UPS and load distribution is in the scope of the Bidder.

n) Supply, fabrication, welding and erection of necessary supports and structures.

o) Painting of Foam tanks, pumps, pipelines, valves, fittings, structural steel, supports etc.

p) Supply, installation, testing & commissioning of computer console and HMI with built in foam system software. Real time status update of the entire foam feeding operation over iOS / Android / Cell Phone application to 5 users should also be provided.

q) Loop checking of the entire system and commissioning of the entire system.

r) Carrying out Site acceptance tests.

s) Removal of excess material from site after completion of job is part of the Bidders scope of work. Excess material shall have to be removed from owner's premises by the Bidder.

t) Supply of mandatory spares.

u) Training to site personnel.

6.2.1 Any item which may not have been specifically mentioned herein but are needed to complete the equipment / system shall also be treated as included and the same shall also be furnished and erected by Contractor, unless otherwise specifically excluded as indicated.

6.2.2 The Bidder shall be capable of demonstrating the entire functioning of the system consisting of at least one mother tank, daughter tank, foam pump, foam feeding arrangement for HVLR monitor, medium expansion foam generator, SCADA software (graphics) along with PLC based control system. Bidder shall have to arrange at Bidders work or any location acceptable to the committee nominated by IOCL within 07 days of opening of techno commercial bid. No extension shall be provided to Bidder towards demonstration. Successful demonstration is an essential pre-requisite for technical qualification in the tender.

6.2.3 The equipment, materials and services shall conform in all respects to high standards of engineering design, workmanship and be capable of performing in continuous commercial operation in a manner acceptable to OWNER who will interpret the meaning of drawings and specifications and shall have the power to reject any work or material which in his judgment are not in full accordance therewith.

6.2.4 Highest standards of safety to be maintained during construction / site work. Since, hot work is envisaged, contractor shall position multi purpose fire vehicle along with one driver and 2 fire operators at site when construction work is in progress. All safety gadgets including Explosive meter shall be available at site during hot job / fabrication in field.

7.0 OWNER'S SCOPE

The following shall be provided by Owner:

a) Entire water hydrant network including hydrant pumps, engine driven pumps, valves and all accessories.

b) Supply and erection of Remote / Portable / Manual HVLR monitors, MEFFG, Foam connection.

c) AFFF foam compound other than 10 minutes of trial run / operation.

d) Incoming power with DG set power back up 415 VAC / TPN and 230VAC / SPN shall be provided by the owner. Power will be provided by OWNER at one point. Further distribution is in Bidder's scope.

e) Uninterrupted Power Supply system for all field equipment viz. Foam Pump and Control logics etc. However UPS for Control Panel shall be in the scope of Bidder.

f) Site Office, Storage space for fabrication and stacking, Water, Electricity for office and fabrication shall be provided by owner on non chargeable basis.

g) Existing cable tray supports and civil supports are to be used for laying cables for Power, Signal and Foam lines. Bidder to provide additional structural bracket for using existing supports, if required.

8.0 SITE CONDITION:

The job needs to be carried out in the existing Depots & Terminal premises. However, during hot work precaution has to be taken to prevent any incidents due to presence of any petroleum vapours. Also since the Depot/Terminal is in operation, hot work permission has to be obtained for working on a daily basis. The explosive meter readings and check for presence of flammable vapour shall be checked by contractor's supervisor along with Owner's representative before undertaking hot work. Full time site engineer and safety supervisor to be provided at site and job shall be carried out only after complying with all safety norms of the depot / terminal

All safety precautions to be taken for carrying out the above jobs like local fire screen personal protective equipments, gas monitors etc. as per requirement and safe working practices in a working petroleum installation.

The contractor has to take necessary precaution for the safe transportation of the material. Before quoting for the said job the contractor is required to visit the site and make himself acquainted with the scope of the job and quote accordingly. The contractor shall arrange all equipment, tools required for execution, testing & completion of the job.

All the safety precautions including supplying & providing localised fire screens for welding of pipe lines etc shall be arranged by the Contractors as per the directions of Engineer in charge at no extra cost.

9.0 SITE VISIT

The Bidder is advised to visit and examine the site of works at all locations and their surrounding and obtain for himself on his own responsibility all information that may be necessary for preparing of the bid and entering into the contract. The cost of visiting the sites shall be at Bidder's own expenses. No extra claim on account of non-familiarity of site conditions shall be entertained during execution of works.

The Bidder and any of his personnel or agents will be granted permission by the Owner to enter upon his premises for the purpose of such inspection, but only upon the explicit condition that the Bidder, his personnel or agents will release and indemnify the Owner and his personnel and agents from and against all liability in respect thereof and will be responsible for personnel injury (whether fatal or otherwise), loss of or damage and expenses incurred as a result hereof.

10.0 OPERATING CONDITIONS

The system shall be suitable for operating in humid and corrosive atmospheres found in oil terminals, installations, depots, POLs, refineries and petrochemical plants in India. The system shall be suitable for relative humidity upto 95% (non-condensing) and ambient temperature range of +5 deg C to +50 deg C. The system shall be tolerant to influences such as electro magnetic interference, radio frequency interference (RFI), aggressive or corrosive vapour, UV radiation, heavy rainfall and electrical surge.

11.0 OPERATIONAL PHILOSOPHY

Operational philosophy for Foam feeding System is detailed out in this document for operation of different type of foam system i.e. Remote / Portable / Manual HVLR Monitors, MEFFG, etc.

11.1 Centralized Foam System:

The centralized foam system shall be provided in which foam feeding shall be piped from central foam station, discharging through fixed or portable delivery outlets to the different Manual and remote HVLR monitors, MEFFG, Portable Monitors etc. Foam piping shall preferably be of ring network type design. Centralized foam system shall be divided into four areas of the installation / terminal / depot viz. MS tank farm area, HSD tank farm area, Pump House area and TLF area. The provision shall be made such that each area can be isolated from other area for maintenance, flushing and draining purpose.

As per OISD-117 the foam requirement is calculated & following foam discharging outlet are provided as per requirement of each area.

A) Remote & Manual HVLR Monitors
B) Medium Expansion Foam Flooding Generator (MEFFG)
C) Portable HVLR Monitors

Calculations of foam requirement shall be as per OISD Std.

The Foam solution requirement calculated shall be based upon Foam requirement at 8.1 lpm/m2 for roof sinking case and is to be designed for 65 minutes of operation.

The Centralized Foam feeding System shall consist of the following:

a) Foam Tank:

2 (two) nos of foam tank shall be provided as per design standard and site requirement with each foam tank of 50% capacity (Total 100 % capacity). The capacity / volume shall be considered based on the highest foam requirement of the Installation / terminal / depot. Foam Tank shall be provided with PV connection for emergency relief. Level switches (high & low) shall be provided on each foam tank. Level transmitter for exact level measurement shall be provided in the foam tanks.

There shall be an arrangement for direct foam feeding to centralized foam system through feeding sump with isolation valve and sump filling shall be done by using barrel. Empty mother tank shall get filled by using standby pump with the help of recirculation provided on discharge of each pump separately. Feeding sump shall be provided for unloading foam barrel / foam tanker, which in turn shall be used for filling empty foam tank.

b) Foam Pump:

3 (three) nos of foam pumps (2 working + 1 standby) shall be provided as per design standard and site requirement. All the pumps shall be provided with tripping interlock on the low level of foam tanks. If foam line pressure exceeds 6 kg/cm^2 due to sudden closing of valve then Pressure Switch signal shall trip the foam pump. Pressure Transmitter cum Switch shall be provided at various locations in the foam network to monitor pressure in the foam line and to detect any leak that may be caused in the lines.

Recirculation line / drain valve shall be provided for intermediate tank transfer by pumps in case of maintenance of any of the tanks. Foam compound shall be kept under circulation during periodic inspection. DG power supply provided for foam pumps shall be provided by Owner. Strainer shall be provided on circulation line to maintain quality of foam concentrate in centralize foam tank.

In normal condition foam lines shall be in filled condition.

c) Daughter Tank:

Daughter tank shall be provided outside tank farm dyke as buffer storage of foam for fire-fighting. Foam compound make up to daughter tank is to be done from mother foam tank of automatic fixed centralized foam feeding system. Daughter tank shall be having capacity as per design requirement for continuous operation for 15 minutes of Remote / Portable / Manual HVLR Monitors, MEFFG, etc as per site requirement.

Ratio controller pump / JRCP shall take foam compound from daughter tank and generate foam solution. Level Switches and Electrically Operated Valve/ MOVs shall be provided in the daughter tanks to control the foam feeding of each daughter tank. Once the level of the daughter tank goes below the set point, it should give signal to the foam pump which in turn get started and thus foam concentrate shall be delivered to the daughter tank.

d) Foam Lines:

Stainless steel foam concentrate lines of suitable size as per site requirement shall be provided. Gaskets in between flanges shall be of fire safe type. The foam lines shall be provided with necessary instrumentation equipments viz. pressure switch, pressure gauge etc for continuous operation.

e) Control Panel:

Site specific PLC based main Control panel shall be provided at the Control Room for remote indication of the signals from the system.

The panel should have HMI based indication of status, alarms and events. It should also have the capability to interface with ESD system and network on existing LAN over OPC.

The PLC shall be designed as per site requirement and at least 20% spare I/O to be considered for future expansion. The PLC should have redundant power supply, redundant processor and single I/O. It should also have a fault tolerant architecture.

f) Operator Interface Console (OIC)

One operator interface console to be provided for system monitoring, The OIC should essentially be a server grade machine running on windows 2008 or higher. The OIC shall also house the application software for the foam feeding system. One console shall be provided with the OIC for housing the monitor of the OIC.

The OIC shall also be capable of being networked in the existing LAN set up over OPC. The Make of the OIC should preferably DELL / HP / IBM

11.2 Features of Centralized foam system:

1. The automatic fixed foam feeding system shall be provided with remote / local as well as auto / manual mode for flexibility of fire fighting operation.

2. Centralized foam supply system with make-up arrangement shall provide continuous foam concentrate supply to any location within the terminal. It shall be able to deliver foam of the required quantities and flow rates to the various

equipments to which foam is required to be fed.

3. Foam system shall be such that apart from feeding of foam to various equipments in the terminal in case of fire, it should also be capable of maintaining the inventory of foam at the location. Replenishment of foam should also be possible through the system.

4. The centralized foam feeding system shall be designed for minimum wastage and maximum throughput.

11.3 Testing of Foam System:

Quality of foam at foam discharging outlet i.e. Fixed/Semi-fixed shall be tested once in six month as per OISD-117 and for that test connection point shall be provided on the foam header lines.

11.4 Draining Facility:

Foam system shall be isolated for flushing / maintenance and draining in different area by providing isolation valves. Flushing can be done with pressurized pneumatic arrangement and shall be available in foam pump house. The foam piping is divided into three segments.

Each segment shall be having drain and vent connections. The segment to be drained (i.e. segment in MS, HSD, Pump House or TLF area and Railway siding) shall first be isolated and the relevant location shall be connected to the pressurized pneumatic arrangement available in foam pump house.

Bidder shall provide schematic drawing of the draining facility along with the technical bid for evaluation by the Owner.

12.0 FAIL SAFE PHILOSOPHY

The system should have features that ensure fail safe operation of the foam feeding system. To ensure the fail safe operation, the system shall be designed in such a way that in the event of failures within the system the functions of which are as per details provided in Annexure-I. Bidder to provide details of fail safe philosophy along with the technical bid.

13.0 APPROVALS:

All junction boxes, electrical equipments, instruments & their accessories installed in hazardous area shall have PESO approval as per hazardous area classification. In case any electrical equipments or instrument located in hazardous area is not explosion proof, it shall be housed in a explosion proof enclosure approved by PESO for use in hazardous area classification (Zone-2, Gas group IIA/IIB).

14.0 INSTRUMENTATION SPECIFICATIONS

14.1 Unless specified otherwise Solenoid Operated Valve (SOV) shall be Stainless Steel body and shall be intrinsically safe /explosion proof.

14.2 Canopies shall be used along with all field instruments in general. Wherever used, these shall be prefabricated and pre-coated type. The colour of the canopies shall be “Red‟ for instruments connected to interlocks / shutdown. The FLP Junction Box outside dyke for local operation shall be provided with canopies.

14.3 Specification of signal cable shall be as per enclosed specification. Signal / Alarm cables (1 pair/2 Pair / 6 pair / 12 pair) shall be shielded (individual as well as overall shielding) and armoured with conductor size 1.5 mm2 minimum for single pair and 0.5 mm2 for multi-pair cable.

14.4 Control cables (3 Core / 6 Core / 12 Core) shall be overall shielded and armoured with conductor size 1.5 mm2 minimum. However, higher conductor sizes shall be considered based on distance. Signaling system shall work on 2 wire and 4 wire based communication and 30% spare core shall be provided

14.5 All signal and control cable shall be FRLS as per IEC-60332 Cat.-A. Alternatively, networking over OFC could also be provided.

14.6 The cable trays and accessories required for interconnecting above ground cables between all Bidder supplied field instruments and local gauge board / Field FLP Junction boxes, shall be supplied by Bidder. Cable trays shall be of Galvanized Iron (GI) material. Cables upto control room shall be in Bidder’s scope.

14.7 All tubes shall be of SS 316 and its OD shall be in mm. All tubes fittings shall be of SS- 316, double compression, suitable for tubes in mm OD.

14.8 All field instruments, junction boxes, etc. shall be as per enclosed specifications. All wetted parts shall be minimum SS.

15.0 SITE ACCEPTANCE TEST:

Bidder shall arrange Site Acceptance Test in presence of Owner's representatives at no extra cost to the owner:

Site Acceptance Test (SAT) shall be conducted within maximum 15 days of intimation of completion of installation. Based upon the above test requirement, Bidder shall develop detailed Site Acceptance Plan & submit it to the owner for approval. Testing to be carried out for maximum 10 minutes of operation. AFFF foam compound other than 10 minutes of trial run / operation shall be provided by Owner.

16.0 SYSTEM SIMULATION:

The system should have the features of operating in the following mode:

(1) Auto / Manual and
(2) Remote / Local

Whenever, the system is taken from auto to manual or remote to local, the event shall be duly authorized by the system. For this, user rights to be defined in the software and suitable logs to be maintained.

17.0 INTERFACE WITH ESD SYSTEM:

The system shall be designed to interface with plant ESD system. The following potential free contacts shall be provided for hard wiring to plant ESD system.

(1) System Energised
(2) System Fault
(3) System in manual mode

Bidder shall provide interlock philosophy along with technical bid.

18.0 DOCUMENTATION:

A) Documents to be submitted along with bid as minimum:
i) Indicative P&ID indicating the complete scheme of instrumentation and controls
ii) Control and Interlocking Philosophy
iii) Power supply requirement for field instruments along with consumption
iv) List of spares during commissioning and during 2 year warranty.
v) Indicative Bill of Material
vi) Technical literature and calibration procedure
vii) Technical literature of pressure gauges, Electrically Operated Valve/ MOV s, pressure switches, level switch etc.
viii) Detailed procedure for calibration of equipments.
ix) Proven track record / demonstration report of the tendered system

x) PESO approval for electrical system/components
xi) Calculation for the sizing of Pumps
xii) Calculation for the requirement of Foam concentrate as per OISD requirement.

Failure to submit the above documents shall lead to rejection of offer.

B) Documents to be submitted for approval after order placement as minimum
i) Detailed design of the system
ii) Detail specification (completely filled up data sheets) with make and model no. before placement of order to sub-vendor
iii) Logic diagram with detailed logic write up
iv) General Arrangement Drawings of panels and internal layout with dimensions
v) Power supply distribution
vi) P&ID & cable schedule
vii) Bill of Material after site survey
viii) Instrument tray layout
ix) Instrument location plan
x) Wiring and termination drawings for panels and junction boxes
xi) Functional design specifications of the offered software
xii) Software license for owner's review and approval
xiii) PESO approval for electrical system/components.

C) Documents to be submitted after commissioning

i) Operating and Maintenance manuals for all offered instrument (2 sets per location)
ii) As built wiring and termination drawings for panels and junction boxes (2 sets per location)
iii) All relevant test certificates.
iv) As built drawings (tank farm) showing the location of systems and associated alarm/control equipment.
v) Data sheets providing technical details of all Major components.

All manuals shall be provided in hard bound A4 size folders with clear printed labels on it. In addition to the hard copies following software shall be supplied after the commissioning

a) Soft copies of the documents / drawings placed in the manual.
b) CD for Software to be used with the system along-with the authorization.

19.0 TRAINING:

Bidder shall impart training to site personnel for routine operation, maintenance & diagnostic test of the foam feeding system. The training shall be imparted at owners site for minimum two days per locations immediately after commissioning.

20.0 WARRANTY

The warranty shall be come into effect after commissioning of segment wise foam feeding systems as per specification

Bidder shall offer performance guarantee for satisfactory and trouble free operation of the foam feeding system for a minimum period of 12 months from the date of commissioning of the system or 18 months from date supply whichever is earlier.

21.0 POST WARRANTY MAINTENANCE

The following shall be covered under post warranty maintenance

a) The Bidder shall provide comprehensive annual maintenance including supply of spares for period of three years after the expiry of the warranty period.

b) The travel, boarding & lodging of service engineer / technician shall be borne by the Bidder. The Bidder shall also bring tools & tackles as required for during maintenance of the system.

c) The bid shall be made year-wise for three years & price validity shall be available for the entire period of the contract (including AMC period).

d) The service under post warranty maintenance shall include :
   - i) Once in six month, complete checking, site acceptance test as per the specification, repair / replacement of defective part/components, and detailed reporting.
   - ii) Once in a year calibration of all instrumentation items, Electrically Operated Valve/ MOV s, pressure gauges/pressure switches & cleaning of the foam network.
   - iii) Emergency maintenance: In the event of any malfunction of the system, experienced service engineer shall be made available at site within 15 days on the receipt of such information from the owner & the system must be brought to the Normal,

e) Any spares supplied during warranty period and which has not been used, may be utilized by the Bidder during post maintenance AMC period.

Annexure - I

FAIL SAFE PHILOSOPHY

The system shall be fault tolerant and shall be designed for maximum safety. The system shall be designed for high availability. As a minimum, the following fail safe features shall be considered.

1. **Failure of mains power to control panel**: In the event of power failure to the control panel, UPS should automatically and seamlessly (bumpless transfer) take over the power supply for 90 minutes of continuous operation

2. **Failure of Foam Pumps:** The system should have features to detect and initiate alarm in case of failure of pumps.

3. **Leak in the foam lines:** The system shall be able to detect leak in the foam lines. Bidder to ensure that, wastage of foam is avoided by means of leaks in the foam lines.

Bidder to design the fail safe system based on the above guidelines and the same shall be submitted along with the technical bid.