CLIENT DOCUMENT

VOLUME – I

A. TECHNICAL SPECIFICATION FOR FIRE PROTECTION WORKS

B. CLIENT CONDITION FOR RETENTION MONEY
# TECHNICAL SPECIFICATIONS
FOR

FIRE PROTECTION WORKS

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>DESCRIPTION</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SCOPE OF WORK</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>TECHNICAL SPECIFICATIONS FOR FIRE HYDRANT SYSTEM</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>TECHNICAL SPECIFICATIONS FOR ADDRESSABLE FIRE DETECTION &amp; ALARM SYSTEM</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>TECHNICAL SPECIFICATIONS FOR FIRST AID FIRE EXTINGUISHERS</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>TECHNICAL SPECIFICATION FOR WATER MIST SYSTEM (TROLLEY MOUNTED, CAPACITY – MINIMUM 50 LTRS)</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>LIST OF APPROVED MAKES</td>
<td>26</td>
</tr>
</tbody>
</table>
TECHNICAL SPECIFICATION FOR FIRE PROTECTION & SYSTEM

(cc) SCOPE OF WORK

Following are the different items of work which have to be supplied, erected, tested and commissioned. The system to conform requirements as per local statutory bodies.

(n) Fire Hydrant System consisting of G.I. Piping with fittings, Valves, Yard Hydrants, and Hose Reels, Anti corrosion treatment, Painting & Accessories.

(o) Addressable fire detection & alarm consisting of Multisensor detectors, Heat detectors, Fire alarm control panel, Manual call points, Beam Detectors Cabling & accessories.

(p) First Aid Fire Extinguishers System consisting of ABC, CO2, Mechanical Foam Extinguisher & Accessories

REGULATIONS AND STANDARDS:
The installation shall conform in all respects to the following broad list of standards in general and in particular the materials used shall bear prevailing ISI marking:

a) IS:901-1975 : Specification for coupling, double male and double female, instantaneous pattern for fire fighting. 


c) IS: 903 : Branch pipe, universal for fire fighting purposes.


g) IS: 884-1969 : First Aid hose reel for fire fighting.

h) IS: 5132-1968 : Hose reel tubing for fire protection system.

j) IS: 2189 : Automatic Fire detection & Alarm


l) IS: 1239 Part -I : Mild steel tubes.

m) IS: 1239 Part -II : Pipe fittings.

n) IS:13039 : Butterfly Valves.

o) IS:5312 : Swing Check NRV

p) IS:13095 : Wafer Check NRV

q) IS:14846 : CI Gate valve Rising/Non Spindle

r) IS: 778 : Gun metal Ball/Gate valve

s) IS:10221 : Code of practice for wrapping & coating of under ground ms pipes.

t) IS 5714 : Specification for hydrant stand pipe for fire fighting.
RESPONSIBILITY

DRAWINGS:
The drawings for the general guidance to the tenderer. The Contractor shall upon the award of the work, furnish detailed drawing necessary to carryout the work at site within 15 days. These shall be submitted for approval to the Architect/Consultants. The work shall be commenced only after the approval of drawing by the Architects/Consultants/Owners.

DRAWING/INFORMATION REQUIRED FROM SUCCESSFUL TENDERER WITHIN 15 DAYS AFTER AWARD OF WORK:
a) Bar chart showing engineering, manufacturing and dispatch of each equipment and erection services.

b) Drawing, literature and technical particulars of all bought out items.

1. Schedule for valves and piping material.

2. Cross sectional drawings.

INSPECTION AND APPROVAL:
The contractor shall arrange all necessary inspection by the Local authority. He shall also arrange for the entire test, obtain and deliver to the Owner any approval required as per the local by-laws. It is the sole responsibility of the contractor to prepare & submit the drawings.

PAINTING:
All piping, furnished under this specification shall be properly painted with Two coat of red oxide primer and two coats of synthetic enamel paint fire red colour after installation and shall meet the requirements as outlined in Fire Protection Manual. Paint used for this work will be lead free quality.

GUARANTEE:
The contractor shall give one year guarantee of the material and workmanship of the entire system is of first class quality and shall correspond to standard Engineering Practice. All the equipments/apparatus shall be guaranteed to yield the specified rating and design capacities, speeds. Any defective equipment/material/workmanship found short of the specified quality shall be rejected contractor shall make good the rejected items at his own cost. Guarantee certificate of equipment from suppliers/manufacturers shall be handed over to the Owner.

DEFECTS & LIABILITY:
All the equipment/ material and the system shall be guaranteed against defective material and workmanship for a period of 12 months from the date of commissioning and handling over the Owners along with all relevant documentation. The contractor shall repair/ rectify or replace all the defective materials, components free of cost. In addition, normal maintenance shall be carried out periodically during the defect liability period including replacement of spares, as required.

INSTRUCTION MANUAL/COMPLETION DRAWINGS/TRAINING:
The contractor shall furnish detailed instruction and operation manual in quadruplicate. The contractor shall also furnish detailed completion drawings as soft copy and hard copy on tracing sheet drawn to an approved scale. The drawings shall be inclusive of control schematic, if any. The contractor shall train the Employer's personnel in the operation and maintenance of the system for one month.

TESTING:
The contractor shall arrange to test the entire system as per the procedure enumerated under particular specifications, after the erection is completed. The tests shall be carried out to the satisfaction of Project Managers/Owners. The results of the tests shall be submitted to the Project Managers / Owner in triplicate. If the results of the tests are not found to be satisfactory by the Project Managers/Engineer-in-charge, necessary rectifications shall be done until the test
results are found to be satisfactory. The installation shall be deemed to be completed only after the successful completion of the tests.

TECHNICAL DATA:
The tenderers shall furnish data of their equipments as per the proforma under 'Technical Data'. The tenders without technical data is liable to be rejected.

CUTTING & WELDING PROCEDURE

CUTTING:
Pipe shall be cut mechanically (by saw or shear) or by oxy acetylene flame. No Electric metal arc cutting shall be allowed. All edges cut by oxy acetylene shall be cleaned of impurities prior to welding joints.

CUTTING TOLERANCE SHALL BE AS FOLLOWS:
a) For pipe connected at both ends to - 1mm
b) Elsewhere to - 3mm

The edge preparation for welding of members more than 1/2" thick shall be done by flame cutting & grinding. Cut faces shall not have cracks or irregularities below 1/2" thick shall be done by Grinding Machine.

PREPARATION OF MEMBERS FOR WELDING:
Sharp edges, rust of cut edges, notches, irregularities fissures due to faulty cutting shall be chipped, grounded over the length, edge of the affected area.

Edge preparation for welding joints shall be carefully & accurately made so as to facilitate a good joints.

Generally no special edge preparation shall be required for members under 1/2" thick.

Edge preparation beveling denotes cutting & grinding of the same so as to result in 'V' or 'X' shapes as per IS:823.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy rust or dirt covered parts be assembled joints shall be kept free from any foreign matter, likely to get into the gaps between members to be welded.

WELDING PROCEDURE:
Welding shall be carried out only by fully qualified welders as tested & approved by the architects. Any test carried out either by the architects or their representative or the inspectors shall constitute a right by them for such tests & the cost involved there on shall be borne by the contractor himself.

When welding is carried out on open air, steps shall be taken to protect the place of welding against wind or rain, the welding electrodes and parts being welded shall be dry.

Before beginning the welding operation, each jointing shall be checked to ensure the parts to be welded or clean and root gaps provided as IS:823.

For single butt welds (in V) and double butt welds (in double V or U etc.). The re-welding of the root is mandatory but only the metal deposits of the root has been cleaned by back gauging or chipping.

The welding joints shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other methods.

For multilayer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping & wire brushing. Packing strips shall not be allowed i.e. All slag shall be removed.
**WELDEDING INSPECTION:**
The welding joints shall satisfy not to have any defects such as cracks, Incomplete penetration and fusion, under-cuts, rough surfaces, burns, blow holes & porosity etc. beyond permissible limits.

**TECHNICAL SPECIFICATIONS FOR FIRE HYDANT SYSTEM**

**PIPING:**
Underground piping shall be of ERW G.I. ‘C’ class. The piping shall be laid not less than one meter below the ground level, suitable masonry supports, and concrete anchor blocks of suitable design shall be provided at every change in direction of pipeline both horizontal and vertical and near every pipe joints where soil conditions are unsatisfactory.

Above ground piping shall be ERW G.I. “C” Class unless otherwise specified and shall conform to IS: 1239/3589 Part-I. G.I. pipes shall be provided with welded joints only unless flanges are warranted. All fittings shall be heavy grade wrought or G.I. conforming to ASTM A234 Gr. WPB (IS: 1239 Part II). The flanges shall be drilled as per relevant Indian Standards.

Flanges shall be faced and shall have insertion of neoprene rubber insertion of Gasket. The joints shall be capable of withstanding a pressure of 10.5 Kg/cm² all the above ground piping shall be supported by angle iron brackets on walls or suspended by hangers from ceiling or concrete pedestals at some places. Piping over ground shall be painted with two coats of approved enamel over a coat of zinc chromate primer after the installation and testing.

**ANTI CORROSIVE TREATMENT FOR UNDERGROUND PIPING:**
G.I. pipe laid outdoor buried in earth shall be wrapped with “Pypkote” make 4mm thick membrane consisting of seven layers of polyethylene polymerized bitumen and polyester mat laid over a suitable primer of fiber and solvent based rubber modified bituminous primer of density 0.9 gms/cum³ applied at the rate of approx 200 -250 gam/sq.m. Material to be laid strictly as per IS:10221.

Pipes passing through masonry walls, foundation, beams shall be taken through embedded pipe sleeve of same material. The pipe sleeve size to be at least 1½ times the diameter of the crossing pipeline. The pipeline running below floor shall be given anti corrosive treatment same as for underground piping.

**HYDRANT VALVES:**
Hydrants should be located at a distance of not less than 2 m from the face of the buildings. This distance may suitably be increased up to maximum 15 m.

Cut off (Isolating) valves are necessary to obtain the best possible pressure. Cut off valve shall conform to IS codes PN 1.0, In case of system having working pressure in excess of 7kg/cm² PN 1.6 rating would necessary for valves.

Water shall be available immediately to all hydrants at all times, with all cut off valves being kept open. Before final inspection, the hydrant system shall be flushed thoroughly.

Connections for any purpose other than fire fighting are not permitted from the hydrants or from any portion of the hydrant service.

Except where impracticable, all hydrant outlets shall be situated 1.0 mtr above ground level.

The stand posts shall be 80mm in diameter for single headed hydrants. It is recommended that stand posts be painted ‘fire red’ (shade No.536 as per IS: 5) and numbered for easy identification.
At least one hydrant post shall be provided for every 30m in case of High Hazard occupancy.

Single headed Landing valves shall be of Gun Metal construction and of 63mm dia oblique female instantaneous pattern with S. S.caps and chains. Landing valves shall conform to IS: 5290 in all respects. Landing valves shall be of gun metal and fitted with 63 mm instantaneous female coupling conforming to IS: 901. The coupling shall be fitted with an internal blank cap (SS) secured by a chain. Landing valves shall be installed on hydrant risers at a height of 1.0 Mtrs from the floor level. The landing valves shall be connected to the wet riser stand pipes by means of a suitable tee, the cost of which is deemed to be included in the unit rate for piping. Flow rate of 1892/946 LPM for Single Headed @ 7 bar

**HOSE REEL DRUM:**
A 19mm dia braided rubber hose (Dunlop or approved make) of 36.0m length is placed near each landing valves. The hose reel is inbuilt with the chrome plated jet type nozzle. A 25 mm dia inlet pipe with threaded end is tapped from wet riser controlled by GM gate valve. The water flow rate shall be not less than 28 l/min and the Range of the jet shall be not less than 6 m. Working / Test pressure of 12 / 18 Kg/ Sq. Cm. The hose reel bracket shall be of swing type with swinging of 180° circular hose drum(made of CI or MS).

**GATE VALVES:**
Gun Metal Gate Valves Threaded type confirming to IS 778 to be placed for each Hose Reel cabinet to control the flow in Hose Reel. The valve shall be capable of withstanding 7 kg/sqcm working pressure of 16 kg/sqcm test pressure.

**BUTTERFLY VALVES:**
GI Butterfly valve(PN 16) Slim seal standard lever operated type conforming to IS standard with required flanges, nuts, bolts etc.

**AUTOMATIC AIR RELEASE VALVE:**
Gunmetal Screwed inlet Single acting type Automatic air release valve to be placed at all wet risers, so that the air bubbles formed as a result of leakages can be overcome. The valve shall be useful at the time of commissioning and maintenance. Working Pressure and Temperature is 10.5kg/Sq.Cm (g) and Ambient Temperature.

**TESTING:**
1. **HYDROSTATIC METHOD:**
After laying and jointing, the piping shall be pressure tested by hydrostatic method. The piping shall be slowly filled with water in order to expel all the air. The piping shall then be allowed to stand full of water for 24 hours. Any leakage at flanges or elsewhere shall be rectified. The pressure shall then be applied by means of a test pump (either hand or electric motor operated). The test pressure shall not be less than 1.5 times the working pressure for a period 2 hours, However, the test pressure shall not exceed 10.5 Kgs/cm² in any case.

2. **RADIOGRAPHIC INSPECTION:**
At least 10% of all the welded joints shall be radio graphically tested and half of the joints radiographed shall be field joints. This entire test to be performed in the presence of Engineer in charge. The joint record shall be maintained by contractor.

3. **HOLIDAY TESTING:**
Before lowering the pipes in the trenches and before back filling the trenches the holiday test is to be done at min 20 KVA. Defective area shall be cleaned and re wrapped as per standard procedure for wrapping and coating.

Capacity of pumps (Diesel Pump, 273 M³/ Hr) shall be checked with respect to the contractor’s piping and equipment layout. Tests shall be conducted to determine the delivery head, flow end BHP of pumps after installation. All the test results shall correspond to the performance curves. All the leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Owner/Architect /Consultant.
The system shall also be tested for its desired performance and function by opening hydrant valves on each floor separately and four landing valves simultaneously. The flow of water at the top most hydrants shall be checked when three landing valves below are open. The cutting in and cutting out pressure setting of starting device shall also be checked for its correct operation.

The test results shall be recorded and countersigned by Owner's representatives and submitted in triplicate for approval by the Owner.

Commissioning:
After testing the system at a test pressure of 10.5 Kg/sqcm the system shall be commissioned for operation for the purpose of fire fighting. Same procedure is to be illustrated to be safety officer of client...

Excavation:
Excavation up to 1.0 mtrs. in depth, for laying pipes up to 150mm dia. Including forming bottom surface to required level, refilling the trenches with selected excavated earth around the pipe in layers of 150mm thick, watering, consolidating inclusive of disposing off / Carting away the surplus earth out side the site to a dump yard acceptable local bodies.

During excavation the contractor shall take particular care to avoid damage to existing drains, water mains, cables or other underground works. Where required, existing pipes, cables etc. Shall be properly slung or other wise supported.

Upto 300mm Normal soil, below 300mm hard rock.

Hard Rock
Any Hard rock (excluding laterite and hard conglomerate) or boulder for excavation for which blasting is required. This will also include plain cement concrete for the excavation for which blasting is required; reinforced cement concrete below ground level. Hard rock requiring blasting as described above but where blasting is prohibited for any reason and excavation has to be carried out by chiseling or any another agreed method.

Blasting of rocks
The contractor shall obtain license from the district authorities, where applicable, for under taking blasting work and for obtaining and storing the explosive rules 1049, revised up to date. The contractor shall purchase explosives, fuses, detonators only from the licensed dealers. He will be responsible for their safe custody and shall maintain an appropriate account of the explosive materials.

Precautions against blasting
Blasting operations shall be carried out under careful supervision of responsible authorized person preferable during certain specified hours. Only trained persons shall be employed. The blasting time shall be notified in advance to the surrounding areas. All precaution shall be taken to avoid accidents and to ensure safety of workers, public and property during blasting operations. Red flags shall be prominently displayed around the area to be blasted and all the people on work except who those actually light the fuses, shall withdraw to a safe distance of not less than 200m from the blast.

Filling
Earth used for filling shall be free from salts, organic or other deleterious matter. All clods of earth exceeding 50mm shall be broken or removed. Unless otherwise indicated, where the excavated material is mostly rock, the rock fragment shall be broken into pieces not bigger than 150mm size and mixed with fine material consisting of decomposed rock, moorum or earth as available, so as to fill up with the voids as far as possible and then the mixture used far filling.

Dismantling
Dismantling of 150mm dia G.I fire hydrant pipe wherever existing pipes are not required as per site conditions, Filling of earth wherever dismantle as per site conditions and any all other existing works also contractor scope.

TECHNICAL SPECIFICATION FOR AUTOMATIC ADDRESSABLE FIRE DETECTION SYSTEM WITH AUTO DIALER FACILITY AT VARIOUS SHOPS / HANGERS PROJECT (PACKAGE II)

1. SCOPE OF WORK:

Supply, testing, installation and commissioning of complete automatic addressable fire detection/ alarm system with built-in TCP/IP networking feature (LAN compatible) and also having auto dialer facility to be installed at various shops/ hangars in the SU-30 ROH Project (Package I) on turn key basis.

2. GENERAL REQUIREMENTS:

a) The design, supply and installation and testing of the entire fire alarm system shall confirm to EN54 / NFPA 72 / IS 2189 standards. The detectors shall confirm to relevant codes for fire alarm system such as IS 11360, IS 12456.

b) The detail dimensions of shops for installation for the said system is as per the tender drawings.

c) The existing SU-30 Flight Hangar (099 Shop) shall also be included for installation of the automatic addressable fire detection system along with the other proposed locations.

d) The addressable fire detection system shall be LAN complaint (fire panels shall have built-in TCP/IP networking feature) with auto dialer facility shall be installed and commissioned totally on Turnkey Basis.

e) The vendor shall undertake detail site survey before quoting the systems to assess for any operational difficulties in integrating the new system with the existing system viz. any operational hindrances i.e., obstruction of buildings, pipelines, geographical conditions etc including actual requirements for the proposed system.

f) The layout drawing of system shall be submitted for prior approval.

g) Cost of any civil, electrical work involved in the commissioning / installation of the system shall be included in the quotation. Separate billing or any additional invoicing for the same shall not be considered.

h) The detection system shall be equipped with necessary feature for avoiding false alarm/call.

i) Initial expenditure for testing the system shall be born by the party.

j) The vendor shall submit 4 sets of manuals consisting layout & wiring diagram of Fire Alarm systems, List of spare parts with part numbers, SOPs, Preventive maintenance, Periodic Servicing, Sources of Suppliers for spare parts, etc.

k) Vendors shall attach list of the parties already carried out the installation/commissioning of similar nature & standard of work. The Vendor shall also submit the performance report of the same.

l) The offered system shall be brand new with state of the art technology and a proven field track record. No prototype equipment shall be offered.

m) The Vendor shall ensure availability of spare parts and maintenance support services for the offered system for at least 10 years from the date of supply.
t) Party shall quote for tentative Annual Maintenance Contract (AMC) for three year after warranty / guarantee period separately in technical bid for information. The cost for AMC shall not be quoted in the price bid for proposed fire alarm systems. A guarantee certificate for taking up of AMC shall be submitted along with the quotation from the vendor duly signed.

u) Party shall serve the warranty/ guarantee period for at least 05 (Five) years from the date of installation and commissioning and testing. Preventive maintenance/Servicing, defect rectification, free replacement of defective parts including attending emergency calls shall be cover under warrantee period.

v) Test certificate, manuals and other relevant documents to be submitted.

w) The supplier shall conduct training for Standard Operation Procedure of the proposed system on free cost.

x) The detailed technical specifications of proposed fire alarm system consisting Addressable Control Panel, smoke detectors, beam detectors, manual call points, flashing- lights (beacon), hooter, etc as per Para 4, 5, 6, 7, 8, 9 & 10.

y) Party shall submit the point wise compliance report for all the requirements specified and deviations if any.

z) The new Addressable FDA system / Alarm Management Graphic Software shall have feature to get ‘status inputs’ of other existing addressable / conventional systems installed at the premises.

aa) The safety aspects during installation and commissioning of the proposed system shall be taken care by the vendor. The vendor shall provide necessary safety gear. Any accident happened during the installation & commissioning is sole responsibility of vendor. HAL will not be responsible for any mishappening or casualties during installation.

bb) All equipments/accessories required for installation and commissioning of the proposed system shall be brought by the vendor.

c) The bill of quantity is as per the tender drawing.

3. **FIRE ALARM SYSTEM:**

3.1 The system shall be designed to detect smoke and generate audio and visual alarm in case of fire.

3.2 The fire alarm system shall confirm to BS-5839 / NFPA 72 in respect of designing and installation, and it shall give audio alarm signals when smoke density in case of photo detector exceeds the preset limit.

3.3 The system shall give pinpoint location of fire with warning system and voice communication for commands and instruction if required.

3.4 The system shall be a microprocessor-based control with central monitoring facility. The basic function of the system shall be able to achieve pinpoint location of alarm indication.

3.5 Secondary functions such as pre warning of possible alarm situation, self diagnosis, checking upon faulty detectors shall also be possible in this system.

3.6 It shall be possible to program each loop with minimum of 198 devices per loop. The FACP (Fire Alarm Control Panel) itself shall have the mother boards/interface of each loop built-in.

3.7 Annunciation (hooter alarm) facility shall also be inbuilt in to FACP, the panel being able to initiate alarm signal for any particular zone.
3.8 In case of actuation of devices due to smoke / fire condition system shall be such that HVAC system will be switched off thus avoiding circulation of smoke from affected areas to other areas.

3.9 The system shall be fully supervised for all fault conditions with distinctive alarm operated fault for fault and fire conditions.

3.10 Test push buttons software features shall be provided to test the electronic circuit and detectors conditions.

3.11 The FACP shall be so programmed that when a particular detector or group of detectors gives a fire signal the FACP shall be able to trip an individual AHU automatically.

3.12 In case of fire in the area conditioned by an AHU the FACP shall be able to trigger a relay that shall shut off the AHU through an additional contact provided in the AHU panel by the AC contractor.

3.13 The FACP shall have the provision for adding an extra loop card for a possible card burn out/malfunctioning. The loop card shall be incorporated in the FACP itself.

3.14 The contractor shall have the FACP software as to be able to change the terminals of any of the loops from any operating card to the extra card. Additional software changes that may be required to fit the extra card into a particular loop shall be carried out at site as and when required at extra cost, except during the period of guarantee.

3.15 The system shall consist of fully addressable type fire alarm control panel, smoke detectors, linear beam detectors, manual call points, hooter, flashing lights (beacon), etc.

3.16 Each loop shall not be divided into more than 8 fire zones. Minimum two isolators shall be used per zone

3.17 The length of each loop shall not exceed more than 1500 m. System shall have facility to calculate the requirement towards battery capacity / loop length using Loop battery calculator.

3.18 The automatic fire alarm and detection system shall consists of fire detectors and manual call points connected by appropriate cables to sector/ zonal panels which in turn shall be connected to the control and indicating equipment/ panel.

3.19 All proposed devices for fire alarm system shall be incorporated with the existing Addressable Fire Alarm System. Also the existing SU-30 Flight Hangar (099 Shop) shall also be included for installation of the automatic addressable fire detection system along with the other proposed locations.

3.20 The addressable fire alarm system shall consists of addressable devices and suitable control panel, zoning and number of detectors shall be as per Para No. 4.2.4 of IS : 2189-2008.

3.21 For ease of communication and synchronization of effort after activation of the fire alarm and detection system a convenient number of easily identifiable sectors/ zones, which the building shall be divided and fixed

3.22 Proper protection/ shelter to be provided for any fire panel, MCP or other equipments which are liable to be exposed to rain, heat, etc.

3.23 A 12AH, 12 V/24V battery/ Standby power supply for at least 48 hours (including 30 minutes in alarm condition) with each Control panel, whichever is higher and 30 VA UPS on fully load condition shall be supplied.

10.15 The standby power supply unit with advance features i.e., dry battery backup, battery performance indicator, auto charger and protection system (short circuit, open voltage and deep voltage) shall be provided with the system.
3.25 All electrical cables shall be Armored type of standard make & quality only. If any cable passing through/ near any hot surfaces, vibration, friction etc the proper protection to cable shall be made.

3.26 Wiring diagrams for understanding the installation of detectors showing at least two detectors in connection and instructions for testing, and maintenance shall be supplied with the detector.

3.27 Description of circuit operation under normal alarm and fault condition and to detectors in dismantled/ unassembled form shall also be submitted.

3.28 Engineering drawings together with other relevant details of design and material used shall be submitted which define the product.

3.29 If any cable needs to be laid underground, the same shall be laid with sufficient protection i.e. inside the metal pipes etc.

Fault isolator module shall be fitted with group of detectors to protect against wire to wire short circuits on the system.

(a) ADDRESSABLE CONTROL PANEL

4.1 FIRE ALARM CONTROL PANEL (FACP):

- This refers to the microprocessor-based panel that shall be connected to the various detector/devices by means of 2 wire loops. The FACP shall be able to identify individual detectors for performance as well as to give pinpoint location of fire alarm. Hooter Alarm as well as facility for cutting off of AHUs and electrical power is also to be included.

- Addressable fire alarm control panel shall be expandable type with at least 80 character LCD display with back-light & alphanumeric keypad for programming shall be provided.

- The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time –of-day basis.

- The system shall be easily configured using ‘plug-in’ addressable loop cards and communication modules. The serial communication module shall allow serial communication for networking and peripherals.

- The fire alarm control panel shall have built-in networking feature to communicate on LAN using TCP/IP Ethernet converter module / interface.

- The fire alarm control panel shall meet EN54 / UL standards.

- The control panel of fire alarm system shall have features like LCD display, keypad, loop card, autodialing facilities, direct & EPABX line simultaneously, other advance features like zone scanning facilities, event recorder, deep discharge protection, testing facilities, manual testing facilities, fire / fault detection, and other features.

- LED’s shall be provided for fire/ fault visual annunciation on the panel front. LED shall also be provided for power supply healthy, battery backup ON, battery/ Charger status, and other features.
SYSTEM CIRCUIT SUPERVISION

The FACP shall supervise all circuits to intelligent devices, annunciators and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate that device or devices are not responding.

The FACP shall have the facility for connection of operation of other fire fighting system through control modules if required.

The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equators, or annunciator programming/information.

It shall be possible to program through the standard FACP keyboard all system functions.

FACP shall supervise the connection between itself and repeater panel, providing the integrity of the cabling and indicating faults both on the repeater and FACP.

All field-defined programs shall be stored in non-volatile memory.

4.3 ENCLOSURE:

(i) The control panel shall be housed in a cabinet suitable for surface or semi flush mounting. The cabinet and front shall be corrosion protected, give a rust-resistant prime coat, and manufacturers standard finish.

(ii) The back box and door shall be constructed with provisions for electrical conduit connections into the sides and top/bottom.

(iii) The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

(iv) The control unit shall be modular in structure for ease of installation, maintenance and future expansion.

4.4 POWER SUPPLY:

11.6.2 The FACP shall operate on 240 VAC, 50 Hz, +/-10% voltage tolerance.

11.6.3 The panel shall have in built battery back up and incase of main power supply fails, these batteries should automatically take over the system thereby monitoring 48 hours (including 30 mins in alarm condition).

11.7 CABLES

4.5.1 The materials covered by this specification shall unless otherwise stated as designed, constructed, manufactured and tested in accordance with latest revisions of the relevant Indian Standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS 1554 (Part I) 1976</td>
<td>PVC insulated cables for working voltages Up to and including 1100 V.</td>
</tr>
<tr>
<td>IS5831 1970</td>
<td>PVC insulation and sheath of electric cables.</td>
</tr>
<tr>
<td>IS8130 1984</td>
<td>Conductors for insulated electrical cables.</td>
</tr>
<tr>
<td>IS 3961 (Part II) 1977</td>
<td>Recommended current ratings for PVC insulated and PVC sheated heavy duty cables.</td>
</tr>
</tbody>
</table>
1. The cable shall be rated for a voltage rating of at least 1100 Volts.

2. Cables shall be selected considering the conditions of maximum connected load, ambient temperature, grouping factor, allowance voltage drops. However it is the responsibility of the contractor to recheck the sizes before cables are procured and connected.

3. The conductor shall be insulated with suitably compounded PVC applied to the conductor by the extrusion.

11.8 **LOOP:**

11.8.2 A loop shall mean a 2-wire circuit connecting minimum of 198 addressable devices (detectors and modules). The loop card shall have built-in short circuit isolators to accommodate class A wiring. Loop driver card shall be plug-in type and shall allow control panel to support input/output point from the addressable devices. Also it shall continuously monitor the values of all sensors and display this value on the panel.

11.8.3 The last device in each loop shall be provided with end of line resistor of suitable value as per circuit design to facilitate cable open circuit and short circuit detection.

11.8.4 The loop control module shall contain its own microprocessor and shall be capable of operating in a local/upgrade mode (any addressable device input shall be capable off activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.

11.8.5 The loop control module shall provide power and communicate with all intelligent addressable detectors and module on a single pair of wires. This loop control module shall be capable of operating as Class A / B type wiring.

11.9 **CENTRALISED MONITORING STATION (GRAPHIC WORK STATION):**

11.9.2 A Personal Computer / software based centralized monitoring panel /Video Display Unit (VDU) shall be installed at Main Fire Station.

11.9.3 Necessary data from various local control panel installed at various shops shall be taken with the existing LAN/WAN connection.

11.9.4 The necessary display for the monitoring shall be LCD/TFT type. The size of display shall be enough to observe the complete layout of the Fire Alarm systems easily with total clarity.

11.9.5 Necessary customized software to operate the complete system shall be provided along with the system.

11.9.6 Layout drawing of each fire alarm system installed at various shops/ hangars shall be displayed on graphic alarm management software.

11.9.7 All the features like fire/ fault/ serviceability status of various detectors and devices shall be incorporated in the required operating software.

11.9.8 In case of any emergency the respective detectors shall display the necessary signal regarding the same with both visible and audible signal.

11.9.9 Main Fire station shall have facility to have full (100%) monitoring & control of each device installed on the new FDA system & the FACPs using the Graphic alarm management software.
11.9.10 The required infrastructure to accommodate the above requirements at Main Fire station shall be provided.

11.9.11 A suitable power supply to the Video display unit shall be provided. (240V, 1 Ph, 50 Hz AC supply).

11.9.12 The standby power supply unit with advance features i.e., dry battery backup, battery performance indicator, auto charger and protection system (short circuit, open voltage and deep voltage) shall be provided with the system.

11.9.13 The new central monitoring system shall also be integrated with existing addressable systems (Make-Notifier), which is located at Non Echo Chambers (096 &099 Shop). The status report from these existing systems shall be taken at Main Fire Station.

11.9.14 The Video Display Unit (VDU) shall be the primary operator for data retrieval, alarm annunciation, commands and programming functions.

11.9.15 The VDU screen shall also have dedicated areas for the following functions like Alarm and return to normal, Commands, reports and programming, Time, day and date.

11.9.16 Alarms and all other, change of status shall be displayed in the screen area reserved for the information. Upon receipt of alarm, an audible shall sound and the condition and point type shall flash until acknowledged by the operator.

11.9.17 The system shall provide memory so that no alarm be lost.

11.9.18 Multiple levels of access to the system shall be provided for operators and supervisors via user defined passwords.

12 DETECTORS:

(a) The detectors shall be addressable type. The chamber should be easily removable for the purpose of easy maintenance.

(b) The address programming shall be done by a handheld programmer / FACP.

(c) Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance.

(d) The detectors shall have a common base to allow easy interchange of various types of detectors. The detectors shall be listed by LPCB / UL and meeting the calibrated sensitivity test requirements of EN54 / NFPA - 72.

(e) Address setting shall be done using rotary switch.

(f) ADDRESSABLE SMOKE DETECTORS:

(g) The photo-electronic optical smoke detector shall be suitable for detecting visible smoke such as produced by slow smoldering fire.

(h) They shall be of the light scattering type using a pulsed internal LED light source and a photocell sensor.

(i) The detector shall be capable of protecting an area up to 80 Sq mtrs at a height of up to 12 mtrs.

(j) The technical specification for smoke detectors shall be as per relevant standards.

(k) A visual indication on normal condition when provided shall be visible from a distance of 6 M.

(l) A visual indication of detector’s alarm condition shall be provided which shall be visible from a distance of 6 M and shall be visually different from the indications of other conditions.
(m) Failure of any indicator lamp shall not prevent the detector from emitting fire signal indicating the existence of fire.

(n) Where separate bases are designed for mounting the detectors, means shall be provided to prevent incorrect alignment and/or incorrect connections of the detector by adopting plugging type systems.

(o) Terminals for external wire shall be provided which shall allow connections of conductor having normal cross-sectional area between 0.92 and 2.5 mm$^2$.

(p) Terminals shall rigidly clamp the conductor between metal surfaces with moderate contact pressure and without damage to the conductor. Disconnection shall be possible only with the help of tools.

(q) The current carrying parts shall not be exposed to unintended contact.

(r) There shall be no electrical and mechanical malfunctioning of the detector.

(s) The ratio of highest r.t.v (response threshold value) and lowest r.t.v. shall not exceed 1.6 and the lowest r.t.v. shall not be less than 0.05 dB/m.

(t) The detector shall meet the performance test and criteria for conformity as per EN54 / IS 11360-1985/ NFPA 71/72/ other relevant IS.

(u) The detectors shall be approved make of IS/UL/FM/VDS/LPCB or equivalent standard.

7. BEAM DETECTORS:

(i) This detector working on the principle of light obscuration shall be capable of responding to both smoldering fires and flaming fires. The sensitivity shall be such as to enable operation at 30% to 50% obscuration.

(ii) The detectors shall be designed such that in case of complete blocking of light beam it gives rise to trouble signal and not a fire alarm.

(iii) The detectors shall be designed such that the small angular movement of the light source or receiver does not effect the operation of the detector and does not give rise to false alarm.

(iv) The FLP beam detector shall consist of units such as a transmitter emitting pulse beam of infrared light rays, which is optically coupled to a photosensitive receiver and reflector on the other end.

(v) When the beam of infrared light is attenuated by smoke or air’s refraction index is changed, the electronic circuit of the detector gives signal for fire alarm.

(vi) The detector unit shall have combined transmitter/receiver unit that can be directly connected to an loop circuit.

(vii) It shall not generate false alarms due to dust build up or due to total obstruction.

(ix) The detector shall have built in automatic gain control to compensate for signal deterioration due to dust build up on the optical surface.
(x) The detector shall have a detection range of 10 – 70m.

(xi) The detectors shall have LED s for normal, alarm & fault status indications.

(xii) The detectors shall be supplied with all the required mounting brackets for wall, ceiling, truss mounting etc.

(xiii) The beam detector shall be a loop powered unit and shall get supply directly from panel.

(xiv) The detector shall have relays for alarm and fault, which shall be monitored by fire alarm panel.

(xv) Transmitters, receivers and/or reflectors shall be mounted on a solid and stable construction which shall withstand vibrations, temperatures or any imposed load.

(xvi) FLP enclosures for beam detector shall be supplied.

(xvii) The beam Detector shall be Approved from IS/UL/FM/VDS/LPCB or equivalent standard.

8. ADDRESSABLE HEAT DETECTORS

9.1 Heat detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute.

9.2 The addressable heat detectors shall be connected via two wires to the fire alarm control panel signaling line circuit.

9.3 The detectors shall provide an alarm and power LED.

9.4 The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel.

9.5 The LED shall be placed into steady illumination by the control panel indicating that an alarm condition has been detected.

9. ADDRESSABLE MULTISENSOR DETECTOR

a) The detectors shall combine photoelectric and thermal sensing technologies to increase immunity to false alarm principal to measure smoke density.

b) The addressable multisensor detectors shall be in position to work in advance multi Sensing, on command from the control panel, send data to the panel representing the analog level of smoke density with automatically adjust sensitivity levels without out the need for operator intervention or programming. Sensitivity increases with heat.

c) The detectors shall provide an alarm and power LED.

d) The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel.

e) Also the LED shall be placed into steady illumination by the control panel indicating that an alarm condition has been detected.
10. MANUAL CALL POINT:

a) The manual call point shall be fully addressable type (without using module) to define the station. The overall size of the MCP shall not exceed 100 mm X 100 mm X 60 mm.

b) The MCP shall consist of an enclosure, with a captive glass pane, and it shall incorporate an addressable communications module. Breaking the pane shall initiate an alarm. No secondary action shall be required by the operator.

c) The call point shall incorporate a plastic-laminated safety glass which will not produce sharp edges when broken, thereby protecting the operator from injury.

d) An externally visible led must be incorporated to indicate when the device is in alarm. The LED shall illuminate when the call point is activated. However, the illumination of the LED will be by command from the control panel.

e) The Manual call points of standard make to be provided inside and outside the shops with fire red colour (Shade 536 of IS-5) epoxy painting, weather proof and inscription of “Break Glass in case of Fire”.

f) A suitable nickel-plated brass hammer duly chained to the box with stainless steel chain shall be provided with each box for breaking the glass.

g) The glass surface shall be minimum 30 cm2 in area and glass thickness shall not exceed 2 mm.

h) Once the glass is broken the alarm shall sound on the floor as well as on the control and indicating equipments and light shall glow to indicate its operation.

i) The alarm shall be maintained by the control and indicating equipment even if someone presses the button subsequently.

j) The MCP shall be Approved from IS/UL/FM/VDS/LPCB or equivalent standard.

11. FLASHING LIGHTS (BEACON)

(i) Strobe / Beacon shall be addressable loop powered and shall provide visual indications towards fire/ alarm warning.

(j) The unit shall consist of solid- state circuitry on a printed circuit board and a red- capped incandescent lamp and audio housed in a dust tight, wall/ ceiling mounting type enclosure. It shall derive power from the fire alarm control panel and shall and shall operate on DC supply.

(k) Flashing lights shall be installed in the enclosed areas. In the event of signal, the lamp shall start blinking with a warning sound enabling operating personnel to evacuate the area.

(l) The Flashing lights shall be approved from IS/UL/FM/VDS/LPCB or equivalent standard.

12. HOOTER / SOUNDER

(i) The Sounder / Hooter shall be addressable loop powered with high sound output and shall be designed to simplify installation, including terminals for both in and out going cables and an earth termination for cable screens.

(ii) Electronic components in the sounder shall be protected by a cover to prevent damage during installation.
(iii) Hooter of 0.5 Kms audible range shall be installed inside and outside of the shop.

(iv) Hooter shall be horizontal single mounting.

(v) The unit shall be powered from fire alarm panel.

(vi) In the event of fire, the hooter shall raise pulsating audio alarms and lamps shall start flashing.

(vii) The sounders for fire alarm shall be electronic hooter having a frequency range of 500 to 1000 Hz.

(viii) The sound of the fire alarm shall be continuous although the frequency or amplitude may vary.

(ix) The distribution of the hooter shall be such that the alarm shall be heard at all site which can be occupied within the protected area.

13. FIRE ALARM TESTING:

1. The FACP shall be checked for basic tests such as visually checking input voltage and amperage. All zones one by one shall be de wired to check for fault signal indication in the FACP.

2. 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.

3. Test shall be conducted for AC fail, charger fail, DC fail, battery disconnect or battery fail. In all such cases the relevant LED should glow and the piezo sound shall also give sound output.

4. The addressable fire alarm system shall be tested as per the following scheduled. Additional testing, as decided by the owner shall also be carried out by the bidder.

5. Testing of Fire alarm system shall be carried out as mentioned in IS/UL/FM/VDS/LPCB or equivalent standard.

14. PHOTOELECTRIC TYPE SMOKE DETECTOR:

(v) The testing shall be carried out for each loop / zone, initially one detector in a zone and subsequently 2 or more disassociated detectors in each zone with time lapse between the detectors to test for alarm priority, alarm queuing and call logging.

(w) Identified detectors will be subjected to smoke aspiration from burning paper/cigarette puffs, rubber and other materials which gives dense smoke held at 0.3 m distance from the detector. 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.

(e) 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 indicates individual addresses of the detectors with achieved analogue values and the time of event.

(f) This test shall be carried out for different loops as well as for 2 loops simultaneously.
15. **ADDITIONAL TEST :**

1. 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.

2. The FACP shall indicate the changes ambient level and automatically adjust with 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.

3. Any part of the loop shall be short-circuited. The FACP shall indicate the communication failure of all the devices connected to 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.

d. All other tests as required by the client at the time of handing over.

16. **FINAL INSPECTION :**

At the final inspection a contractor shall provide a factory trained representative the manufacturer of the major equipment shall demonstrate that the system function properly in every respect.

17. **INSTRUCTION :**

2. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system component and the entire system including program changes and functions shall be provided.

3. The contractor and/or the system manufacturer’s representatives shall provide a typewritten sequence of operation.

18. **MAINTENANCE :**

3.1 The maintenance of Fire alarm systems during warranty period is solely responsibility of the vendor. Vendor need to provide activity chart giving details of schedule of preventative maintenance of the system for each year.

3.2 Minimum of 6 nos. of visit per year (once in 2 months) towards preventive maintenance shall be required. Vendor to attend to complaint within 36 – 48 Hours of being reported.

Detailed operation and maintenance manual in duplicate shall be supplied.
TECHNICAL SPECIFICATIONS FOR FIRST AID FIRE EXTINGUISHERS

Work under this section shall consist of furnishing all labor material appliances and equipment necessary and required to install fire extinguishing hand appliances.

The vendor shall install and commission the portable Fire extinguishers as per tender drawing. Without restricting to the generality of the foregoing, the work shall consist of the following.

GENERAL REQUIREMENTS:

Fire Extinguishers shall conform to the following Indian Standard specifications as revised and amended up to date.

- Dry Powder Type : IS: 2171-1962
- Carbon Di-oxide : IS: 2878/1976
- Mech Foam type : IS: 10204


The appliances shall be installed in readily accessible locations with the appliances brackets fixed to wall by suitable anchor fasteners.

Generally, fire extinguishers should be placed as near as possible to exits or stair lands without hindering the escape routes. Wherever possible, advantage should be taken of normal routes of escape by placing these in positions where these shall readily be seen by persons following the natural impulse to get out of danger.

Wall mounted fire extinguishers should be placed on the supporting wall or in wooden, metal or plastic cabinets in such a way that their 1000 mm bottom is above ground level. When installed in the open, fire extinguishers should be placed on masonry platforms or in wooden/metal/plastic cabinets in such a way that their bottom is 1000 mm above ground level.

Operating instructions shall be provided and mounted in a brushed stainless steel frame with a clear plastic cover adjacent to the control panel. The instructions shall include the following:-

- Procedure to follow when fire is detected.
- How to reset and test the entire system after trouble or fire is detected.
- Location and type of extinguishers as per drawing

TECHNICAL SPECIFICATION FOR FIRE EXTINGUISHERS

(a) DCP EXTINGUISHER (CARTRIDGE TYPE) CAPACITY : 5 Kgs.

(i) Dry Chemical Powder type fire extinguisher,
(ii) Complete with gunmetal cap, bracket
(iii) Initial charge of 5,10 kgs. Sodium bi-carbonate base dry chemical powder.
(iv) Dry chemical powder bearing ISI mark IS: 4308
(v) Fully charged 120,200 gms CO2 gas cartridge. Gas cartridge bearing ISI mark IS: 4947
(vi) Fitted with 55 cms long discharge hose with open type nozzle.
(vii) Extinguisher bearing ISI mark IS: 2171.
(viii) MS body Cap as per IS: 318 MS
(ix) Siphon tube as per IS: 3601.
(x) Filled weight of extinguisher 11.5 Kgs.
(xi) Tested to 30 Kgf/cm² for 2 minutes.
(xii) Supplier to attach test certificate

(b) DCP EXTINGUISHER (ABC Powder type) CAPACITY : 5 Kgs.

(xiii) Dry Chemical Powder (ABC) type fire extinguisher,
(xiv) Complete with gunmetal cap, bracket
(xv) Initial charge of 5,10 kgs. Sodium-bi-carbonate base dry chemical powder.
(xvi) Dry chemical powder bearing ISI mark IS: 4308
(xvii) Fully charged 120,200 gms CO2 gas cartridge. Gas cartridge bearing ISI mark IS: 4947
(xviii) Fitted with 55 cms long discharge hose with open type nozzle.
(xix) Extinguisher bearing ISI mark IS: 2171.
(xx) MS body Cap as per IS : 318 MS
(xxi) Siphon tube as per IS: 3601.
(xxii) Filled weight of extinguisher 11.5 Kgs.
(xxiii) Tested to 30 Kgf/cm$^2$ for 2 minutes.
(xxiv) Supplier to attach test certificate

**12.6 MECHANICAL FOAM (AFFF) TYPE FIRE EXTINGUISHERS (CAP 9LTRS).**

Aqueous Film Forming Foam (AFFF) Mechanical foam type extinguishers

1. Capacity of fire extinguisher: 9 ltrs.,
2. Complete with gunmetal cap. Bracket, fitted with flexible hose terminating in a foam branch pipe
4. 540 ml AFFF 6% charge bearing ISI mark.
5. Extinguisher bearing ISI mark IS; 10204.
6. the AFFF concentrate to be as per IS 4989 Part-2
7. Supplier to attach test certificate

**4. CARBONDIOXIDE GAS BASED PORTABLE EXTINGUISHERS**

i) **Carbon dioxide Extinguishers [Capacity (2 KG)]**

1. Capacity – 2 Kgs
2. Consisting of brand new high-pressure steel cylinder bearing IS 7285
3. Approval of Chief Controller of Explosives, Nagpur
4. Wheel type valve bearing IS 3224
5. CO2 gas as per IS: 307
6. Internal discharge tube IS:738
7. Discharge duration 8-18.seconds.
8. Filled weight of extinguisher 7.6 kgs tested to 236 Kgf/cm$^2$.
9. Suspension clips (installation bracket with nails)
10. Elbow type discharge hose (brass adaptor)
11. With washer
12. The extinguisher should be bearing IS 2878
13. Supplier to attach test certificate

ii) **Carbon dioxide Extinguishers [Capacity 4.5 KGS]**

1. CO2 type 4.5 kgs capacity fire extinguisher assembled from brand new CCE approved cylinders,
2. Internal discharge tube: IS: 738
3. One meter high-pressure rayon braided hose, discharge horn bearing.
4. The extinguisher should be bearing IS 2878.
5. CO2 cylinder as per IS 7285 CCE approved.,
6. Wheel type valve bearing IS 3224
7. CO2 gas as per IS: 307,
9. Filled weight of extinguisher 17 Kgs tested to 236 Kgf/cm$^2$.
10. Supplier to attach test certificate
iii) **Carbon dioxide Extinguishers [Capacity : 6.8 KGS (Twin cylinder trolley mounted)]**

(a) Twin carbon dioxide (CO2) fire extinguishers of 6.8 kgs capacity each (i.e., 2 X 6.8 Kgs CO2 cylinder) Trolley mounted.
(b) Extinguisher confirming to IS: 2878.
(c) CO2 cylinder as per IS 7285 CCE approved
(d) Fitted with high pressure flexible rubber discharge hose 12 mm dia. X 9 meters long with common manifold, with puncturing device connected with discharge hold
(e) Complete set manufactured to IS : 8149/1976 and mounted on a trolley.
(f) The applicator to be extended type with telescopic arrangement..
(g) Supplier to attach test certificate

iv) **Carbon dioxide Extinguishers [Capacity : 45 Kgs (Twin cylinder hand held fire suppression system)]**

1. CO2 based hand held fire suppression system consisting of 2 Nos. high pressure 45 Kgs CO2 CCOE approved
2. Extinguishers confirming to IS: 2878.
3. Cylinder as per IS-7285 with brass discharge head connected to a common brass discharge head connected to a common manifold pipe confirming to ASTM a 106 GR-B SCH-80 by ¾” inch high pressure,
4. Flexible wire reinforced rubber discharge hose,
5. 30 metre long hose reel
6. Painted red wound in a MS rotating hose drum connecting to horn and valve assembly complete with safety relief valve, cylinder rack and MS continuous strap .
7. The applicator to be extended type with telescopic arrangement.
8. Supplier to attach test certificate.

*Technical specification for Water Mist system (Trolley mounted, Capacity – Minimum 50 Ltrs)*

348 **SCOPE OF SUPPLY:**

The Minimum of 50 Litre capacity water mist system trolley mounted with water mist gun of discharging both jet and spray is proposed to be placed at different Aircraft Hangers. The scope of supply cover complete installation and testing of the system.

349 **GENERAL REQUIREMENTS:**

1.30 The system shall be operated manually.
1.31 The contractor/supplier shall submit 4 sets of manuals consisting of design of water mist system trolley mounted, list of spare parts with part numbers, SOPs, Preventive maintenance, Periodic Servicing, Sources of Suppliers for spare parts, etc.
1.32 Vendors shall attach list of the parties already supplied. Vendor shall also submit the performance report of the same.
1.33 Vendors shall ensure availability of spare parts and maintenance support services for the offered system for at least 10 years from the date of supply.
1.34 Party shall serve the warranty/guarantee period for at least 2 years from the date of supply and testing.
1.35 Initial expenditure for testing the system shall be born by the party.
1.36 Test certificate, manuals and other relevant documents to be submitted.

1.37 The supplier shall conduct training for Standard Operation Procedure (SOP’s), routine maintenance and major repairing of the system at HAL site of the proposed system on free cost at HAL site at the time of supply.

1.38 Party shall submit the point wise compliance report for all the requirements specified and deviations if any as per under mentioned format.

1.39 Vendor shall quote the systems with MAKE & Model No of the equipments.

1.40 Any damage while transporting the system for supply and before handing over to HAL Fire services will be whole responsibility of the supplier. The cost for any damage shall born by the supplier.

1.41 The contractor shall supply 4 sets of drawing of the complete and finally approved installations for owner’s use and records.

1.42 The water mist system shall be as per EN 1866/ IS/ NFPA/ UL//FM/VDS/LPCB or equivalent standards.

350 TECHNICAL REQUIREMENTS:-

351 The system shall consist main container/vessel, compressed air cylinder, discharge tube, discharge gun, pressure gauge, safety valve, connecting metal pipes, trolley with suitable wheels, carrying handles, necessary straps for holding Air cylinder, arrangement for coiling discharge hose & discharge gun etc.

352 The operating pressure of the proposed system shall be minimum 7 bar pressure.

353 The system shall be capable of carrying 50 Liters (Minimum) of water in the main vessel.

354 The contained of vessel shall be expelled by air pressure with the help of air cylinder of capacity of minimum 6 litres & pressure of 200-300 bar.

355 The air cylinder shall be approved by CCE/ PESO.

356 The air cylinder shall be capable for the discharge of fine water mist through discharge gun.

357 The system shall be suitable to A & B class of fire & also live electrical fire.

358 The system shall be able to recharge quickly without cleaning with much maintenance so as to be ready for use for any fire emergency.

359 The main container / vessel of the proposed water mist fire fighting system shall be made of stainless steel / aluminum alloy/ stainless steel 316 grade with proper thickness as per standard/ SS alloy/ corrosion free Aluminum alloy with special anti corrosive coating. The suitable anticorrosive coating with sufficient thickness shall be carried out in such a way that the life of the vessel shall not be less than 10 years.

360 Pressure gauge on top of the main vessel/container and/ or air cylinder shall be provided.

361 Discharge gun shall not be more than 2.0 Kgs .

362 The fire-fighting agent shall have the mixtures of water and AFFF foam.

363 Carbon composite Compressed/ seamless carbon steel air cylinder shall have rating of at least 6 ltrs & pressure of 200-300 bar to be used for discharge of 50 ltrs solution with full power.
364 The design of the gun shall be such that there is no recoil pressure during operation and shall have the locking system to avoid misuse.

365 The system shall be provided with a safety valve/device considering the design criteria of the system.

366 The system shall be compatible to be used with the bigger cylinders of the capacity of 6 ltr and above water capacity for longer duration operation.

367 The system shall be suitable to fight live electric fires.

368 The system shall be able to release droplets size between 200 to 400 micron, which in turn shall provide more kinetic energy effective operation. It shall maintain constant pressure during whole operation.

369 The system shall be clean automatically as the remaining air is blown out of the container and system shall be ready for quick second recharge. Shall work as effectively even air in the cylinder is as low as 40 to 50 bar. The system shall be recharged two or three times with same pressure bottle.

370 The acceleration in the system shall be done through operating air pressure.

371 Operating temp. shall be within -50°C to 70°C. The system shall be able to be stored both in upright as well as flat condition.

372 The extinguishing agent used should not cause deposit in the container.

373 Any type of available water such as sea water, dirty water can be used in the container without effecting the operation.

374 Stream of the jet shall be required by user itself controlled at pressing the trigger of the gun.

375 The water container shall be mounted on 2 wheel trolley as per EN 3-7 standard which shall accommodate air cylinder, hose reel (Discharge tube) and discharge gun. Wheel diameter of the trolley shall be less than or equal to 700 mm, tubeless tyres and frame shall have shock absorber. The trolley shall be easily carried on rough terrain. The suitable carrying handle shall be provided with the trolley. The design of the trolley shall be suitable for best maneuvering in case of fire. The trolley shall be made of preferably of M.S. painted with epoxy paint fire red as per IS. The fire fighting system mounted on trolley shall be carried easily from one spot to other in case of emergency by single person.

376 The direction of opening/closing of filling cap in main vessel shall be clearly marked.

377 The provision for releasing of the air pressure shall have incorporated in the system to neutralize the main vessel pressure after use.

378 A good quality and reputed brand Pressure gauge shall be provided for measuring the pressure of compressed air of the cylinder.

379 The main container/vessel shall be painted by the enamel fire red paint.

380 The PVC sticker with Name of the equipment, Operating instruction, suitability over class of fire, Make/Model, year of manufacturing, name of manufacture etc. shall be sticked on the main vessel. The backpack assembly shall be comfortable and easy to wear by the Fireman.

381 The extinguishing media shall be mixture of water and 6% Aqueous Film Forming Foam Conc.(AFFF).
The main container shall be provided with the safety valve which will be operated / actuated automatically.

The working / operating pressure of the system shall be designed in such a manner that the performance of the system shall meet the criteria.

The Discharge tube shall be high pressure armored rubberized hose of the length minimum 5 meters.

The discharge tube shall be externally protected with the metal spring coil.

The compressed air cylinder shall be made by carbon fiber / composites which must be approved by the CCE/PESO , Nagpur.

The capacity of the air cylinder shall not be less than 06 liters at minimum 300/200 bar pressure.

The all details of the cylinder like cylinder Srl.No, year of manufacturing, date of hydraulic testing etc shall be provided.

The Adopter assembly of cylinder shall be as similar as air cylinder of the Standard Breathing Apparatus Set.

The discharge gun shall be so designed that there shall be no backpressure / hammer effect or any jerk to the user during pressure. The gun shall be easy to operate by the user.

The gun shall be made by Stainless Steel with the pistol grip handle with provision to avoid any electrical shock.

The complete water mist gun shall be light in weight.

The discharge gun shall have the feature of ‘jet and spray’ mode both for discharge of extinguishing media.

All metal parts (excluding SS) which come in direct contact with the foam solution shall be properly plated / coated with anticorrosive material with sufficient thickness.

PERFORMANCE REQUIREMENT:-

The water mist fire fighting system shall meet the following performance characteristics:-

4.1 The discharge rate shall be within 24 to 35 ltrs per minute

4.2 The droplet size of the water mist produced by the system shall be between 200 to 400 microns.

(a) The lancing distance shall be from 9 to 18 meters in jet mode and 4 to 8 Meters in spray form.

5 STANDARD ACCESSORIES/SPARE PARTS:-

Standard accessories/spare parts to be supplied with the system:-

5.1 Compressed Air Cylinder of the minimum 6 Liters at pressure 300/200 bar – 01 No.

5.2 Delivery hose of minimum 5 meters length with suitable adopters - 01 No.

5.3 AFFF (6%, UL Approved) Foam Conc. in PVC Jerry can - 100 Liters.

5.4 PVC Mug with PVC funnels for measuring AFFF - One Set
5.5 Filters for Extinguishing Media - 02 Nos.
5.6 Standard Tool Kit suitable to the system - One Set
5.7 Filling cap ‘O’ Rubber Ring – 10 Nos.

**LIST OF APPROVED MAKES**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Makes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PIPES &amp; FITTINGS</strong></td>
<td></td>
</tr>
<tr>
<td>G.I Pipes/Fittings</td>
<td>Jindal / Tata</td>
</tr>
<tr>
<td>G.I Fittings</td>
<td>VS/JK</td>
</tr>
<tr>
<td>Paint</td>
<td>Berger / Asian/J&amp;N</td>
</tr>
<tr>
<td>Paint Primer</td>
<td>Asian/Jenson Nicholson/Burger</td>
</tr>
<tr>
<td><strong>HYDRANT SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Gun metal valves</td>
<td>Zoloto/Leader/Kalpana</td>
</tr>
<tr>
<td>Butterfly valves</td>
<td>H.sarker/Kirlosker/upadyaya/Kalpana</td>
</tr>
<tr>
<td>Wrapping &amp; Coating tape</td>
<td>IWL</td>
</tr>
<tr>
<td>Hydrant valves &amp; accessories</td>
<td>Newage/Winco/Zenith/Minimax</td>
</tr>
<tr>
<td>Hose pipes</td>
<td>Newage /Winco/Dunlop</td>
</tr>
<tr>
<td>Air release valve</td>
<td>PN Kirloskar/H sarkar/Upadhyaya</td>
</tr>
<tr>
<td>Rubber pipe for Hose reel</td>
<td>Denlop/Newage</td>
</tr>
<tr>
<td><strong>FIRE EXTINGUISHERS SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Fire Extinguishers</td>
<td>Newage/Safex/Zenith/Minimax</td>
</tr>
<tr>
<td>Water Mist Fire Fighting System</td>
<td>ASKA/HNE/AFT</td>
</tr>
<tr>
<td><strong>FIRE DETECTION &amp; ALARM SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Detectors</td>
<td>Morley/Notifier/Siemens/Edwards/Zicom</td>
</tr>
<tr>
<td>Control Panel</td>
<td></td>
</tr>
<tr>
<td>MCP</td>
<td></td>
</tr>
<tr>
<td>Electronic Hooters</td>
<td></td>
</tr>
<tr>
<td>Response Indicators</td>
<td></td>
</tr>
<tr>
<td>Control modules</td>
<td></td>
</tr>
<tr>
<td>Monitor module</td>
<td></td>
</tr>
<tr>
<td>Conduit pipes/accessories</td>
<td>BL/Gupta (Metallic)</td>
</tr>
<tr>
<td>Power/control Cables</td>
<td>Varsha/policab/Excel</td>
</tr>
</tbody>
</table>
CLIENT CONDITION FOR RETENTION MONEY

Retention money is 5% of contract sum, which shall be deducted @ 10% from Running Account bills till the amount to the extent of 5% of the Contract Sum is reached. However the contractor may submit an unconditional irrevocable Bank Guarantee as per the format included in the tender document from any Nationalized / Scheduled Bank/s for the entire amount of Retention money ie. 5% of contract sum till completion of work having validity for the entire contract period + 90 days and on submission of such a bank guarantee no recovery will be made from the RA bills. The contractor shall extend the validity of the Bank guarantee for the corresponding period, the contract is extended or the execution of the work is delayed due to whatsoever reasons and the contractor shall keep the bank guarantee current and valid till submission of final bill.

On completion of work this retention money will be retained as Defect liability Deposit which will be equal to 5% of the final contract sum. The contractor may submit an unconditional irrevocable Bank Guarantee as per the format included in the tender document from any Nationalized / Scheduled Bank/s for the entire amount of Retention money ie. 5% of final contract sum having validity till expiry of defect liability period + 90 days. This amount retained against retention money will not carry any interest till it is held by HAL.

All charges towards making bank guarantee and it’s extension or revalidation etc. shall be borne by the contractor.

The Retention Money will be retained as defect liability deposit, which will be refunded on receipt of claim from the contractor after completion of the defect liability period and on rectification of all the defects (if any) pointed out during the defect liability period satisfactory and on certification by the consultant and Engineer In Charge.

The Retention Money shall be forfeited if the work is not completed in all respects by the contractor or the contractor withdraws or abandons the work during the course of execution.