



**Directorate General NDRF & Civil Defence (Fire)**  
**Ministry of Home Affairs**  
**East Block 7, Level 7,**  
**NEW DELHI, 110066,**

**Fire Hazard and Risk Analysis in the Country for Revamping the  
Fire Services in the Country**

**Final Report –**  
**General Specification and Approximate Cost of Firefighting &  
Rescue Vehicles and Specialized Equipment**

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Submitted by

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# 1 Firefighting & Rescue Vehicles and Equipment in India

## 1.1 Introduction

The role of firefighter in fire and emergency services is to extinguish fire, rescue trapped persons, provide medical first aid and also respond to various fire accidents and disasters caused by various natural and manmade hazards.

A firefighter fights fires to prevent loss of life, and/or destruction of property. In fact, it is a risky profession, that requires firefighting and rescue vehicles and specialized equipment to work effectively and safely to mitigate consequences of a fire & emergency incidence of an area.

## 1.2 Fire Services Vehicle and Specialized Equipment

Firefighting and rescue vehicles and specialized equipment used in fire services across the country are fabricated largely as per Bureau of Indian Standards (BIS). BIS formulate the specification for these firefighting vehicles and equipment as per the recommendation by a committee of fire chiefs, manufacturers, and users of various departments. Accordingly, it is suggested that the BIS specification should be taken as a basis for purchasing fire equipments in every fire services. However, it has been observed that, there are new types of equipment used by various state fire services, which are not included under BIS specifications. The fire services can evaluate the performance of these new type of equipment depending upon the need of such equipment in an area for a specific operation. Therefore, it is difficult to prepare a standard list of all the firefighting vehicles and equipment that can be provided for every fire station in the country, because of:

- (i) Size of firefighting and rescue vehicles will depend on several factors such as local road condition, topographic condition etc.
- (ii) Need of accessories will also depend on specific need of the State/UT Fire & Emergency Service/ Fire Service. Accordingly, requirement of equipment mounted on firefighting and rescue vehicles may also be modified.

Therefore, the State Fire Services may modify the specification of firefighting and rescue vehicles and equipment based on specific prerequisite.

The specification and approximate cost of firefighting and rescue vehicles and specialized equipment are given in **Chapter- 2.0** and **Chapter- 3.0**: This cost may vary depending upon the equipment/ accessories added or deleted.

***Disclaimer: All standards are subject to revision, and nothing in this standard restrict user to go for higher performance parameters to meet their requirement.***



## 2 General Specifications for Firefighting and Rescue Vehicles

The detailed specifications of firefighting and rescue vehicles are mentioned below:

### 2.1 Water Tender

Approximate Cost: Rs. 35 Lakhs

#### 2.1.1 CHASSIS

The chassis shall be suitable to carry minimum 16 tons G V W, 4x2. The engine fitted on the chassis shall comply with the respective emission norms in force at the time of delivery of chassis. The chassis shall be brand new with the following specifications.

- |                         |  |
|-------------------------|--|
| (i) Engine inter        | : 6 cylinder, in line, 4 stroke, water cooled, Turbo charged, cooled, Diesel engine developing not less than 150 bhp and Conforming to prevalent emission norms. |
| (ii) Clutch             | : Single plate dry friction type hydraulically actuated  |
| (iii) Gear              | : Synchromesh gear box with 6 forward and 1 reverse gear   |
| (iv) Front Axle         | : Heavy duty, forged, 'I' beam.  |
| (v) Rear Axle           | : Single reduction, hypoid gears, fully floating axle shaft  |
| (vi) Steering           | : Integral hydraulic power assisted steering   |
| (vii) Brakes operated   | : Dual circuit fully air braking system with pneumatically parking brakes on rear wheels.  |
| (viii) Suspension       | : Semi- elliptical leaf spring at front and rear with hydraulic double acting shock absorber on front.   |
| (ix) Frame              | : Ladder type heavy duty frame with riveted/bolted cross members   |
| (x) Wheels and Tyres    | : Suitable size available in local market with minimum 16 PR – 7 Numbers (including spare wheel)   |
| (xi) Fuel Tank          | : Minimum 160 liters capacity.   |
| (xii) Electrical System | : 12/24 volts. 120 Ah capacity battery with Alternator.  |
| (xiii) Cowl cluster,    | : Standard cowl duly painted in RED color with instrument rear view mirrors, Wiper system, original driver seat, safety belts.                                   |
| (xiv) GVW               | : Not less than 16,000 Kg  |
| (xv) Safety Features    | : Anti Lock Breaking System (ABS)  |

#### 2.1.2 PUMP

The pump shall be centrifugal type, multi pressure, having output capacity of 2000 LPM at 7 kg/cm<sup>2</sup> and 300 LPM at 35 kg/cm<sup>2</sup> at 3 meters suction lift at NTP condition. The low-pressure side will be of single stage and the high-pressure side also with single stage having regenerative type impeller.

The pump shall comply to the following performance parameters-

- a) Normal Pressure output : about 2,000 LPM at 7 kg/cm<sup>2</sup>
- b) High pressure output : about 300 LPM at 35 kg/cm<sup>2</sup>
- c) Maximum pressure in : about 14 kg/cm<sup>2</sup> (shut off  
Normal pressure mode. pressure)
- d) Maximum pressure in : 45 kg/cm<sup>2</sup> High-pressure mode
- e) Deep lifting capacity of Pump : 30 cm/sec max. up to 7 meters in 30 sec  
at NTP condition.

- The overall pump shall be constructed from gunmetal. The normal (low) pressure impeller, volute, and impeller wearing shall be made from gunmetal conforming to Gr II of IS 318/1981 and the regenerative type high pressure impeller shall be of Aluminum, Bronze (AB-2). The pump shaft shall be made from stainless steel conforming to IS 6603/1972. The bearing housing will be made of C.I. and all the studs and bolts coming in contact with water shall be of stainless steel. The bearings used in the pump shall be of reputed make.
- The normal and high-pressure impeller shall be mounted on a single shaft and normal (low) pressure impeller shall be dynamically balanced.
- The pump shall be provided with self-adjusting mechanical carbon seal with interface plate. The mechanical seal assembly shall with stand dry running of pump up to 2 minutes without any damages.
- The pump shall be provided with an inbuilt filter of easily removable type, which shall filter the water before entering into the high-pressure stage impeller.
- Operation of low pressure to high pressure or vice-a-versa shall be possible by actuation of single lever.
- The pump shall have facility to operate low pressure and high-pressure mode simultaneously or individually. While high-pressure mode is in operation and delivering about 300 LPM at 35 kg/cm<sup>2</sup>, the pressure in low-pressure side shall not exceed 8.5 kg/cm<sup>2</sup>.
- The size of high-pressure outlet shall be of 25 mm connected to high-pressure hose reel.
- The pump shall be provided with one suction inlet of 100 mm diameter having round threads conforming to IS 902 of 1974 and 2 numbers of 63 mm delivery outlets having screw down type valves fitted with instantaneous couplings as per IS 903/1993. The delivery valve spindle sealing shall not be of gland type. The high-pressure outlet shall not be less than 25 mm and shall either be flange on screw type.
- The efficiency of the pump shall be such that the power and RPM required shall not be more than available with the engine.
- The pump housing shall have provision to connect to internal cooling system.
- The pump shall be mounted at the rear of the vehicle connected to P.T.O. by propeller shafts and universal and slip joints with sufficient number of bearing supports.

- Pump primer – The priming system shall be Reciprocating type or fully automatic watering type which shall not require any operation whatever from the pump operator other than throttling the engine to the required RPM. The primer shall get automatically disengaged once the pump is registered the pressure. The primer shall be capable of lifting the water in 30 seconds from the depth of 7 meters (up to pump inlet) at NTP condition. The reciprocating pistons shall be made up of stainless steel or Gun Metal. The cylinder and priming valve housing shall be made from gunmetal.
- In addition, exhaust ejector type primer capable of lifting water from 7 meters within 30 seconds shall also be provided.

### 2.1.3 PUMP TEST

The pump fitted on the vehicle shall be subjected to various tests as detailed below-

- (i) The pump with its all fitments will be subjected to Hydrostatic testing on a pressure of 21 kg /cm<sup>2</sup>.
- (ii) The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of mechanical carbon seal. After this test there shall not be any leakage of water through carbon seal.
- (iii) The pump performance test will be carried out by running the pump at constant RPM at 2600 and measuring the discharge at various pressures.
- (iv) The pump will be subjected to Endurance test for a period of FOUR hours continuous running. The first Three hours the pump shall deliver rated output of 2000 LPM at 7 kg/cm<sup>2</sup> and next one hour will be 300 LPM at 35 kg/cm<sup>2</sup>.
- (v) During the endurance test the water shall not be replenished in the cooling system and the temperature of the cooling water and engine oil should not exceed the manufacturers standards recommendations for the continuous operation and engine should not show any sign of temperature increase.

### 2.1.4 POWER TAKE OFF (P.T.O.)

The P.T.O shall be heavy-duty type of suitable ratio capable of transmitting the full torque of the engine in first gear. The lever for engaging the P.T.O. shall be provided in the Driver's cabin with proper locking arrangement. The P.T.O. shall be mounted on heavy duty cross members and support brackets between the longitudinal members of the chassis frame. Means shall be provided to check the oil level in the P.T.O. and suitable drain plug shall be provided at the bottom. A cooling coil made of copper tubes shall be provided inside the PTO at the bottom to prevent the oil of the P.T.O. from heating.

### 2.1.5 WATER TANK

The capacity shall not be less than 4,500 liters. The tank body and baffles shall be of minimum 3.5 mm thick Stainless Steel (S.S) plates conforming to IS 304. The sides of the tank shall have Die Pressed reinforced webs for better strength and rigidity. The design of the tank should be such that the complete width of the vehicle is utilized and the height of the tank is to be kept as low as possible for better stability.

- (i) A tank of required capacity constructed out of mild steel treated for anti-corrosion shall be suitably mounted on the chassis in a manner keeping in view the proper load distribution on the axles.

- (ii) A full length runner from behind the driver cabin till end of chassis frame shall be provided and made out of S.S. Channel of 100 x 50 x 3.15 mm suitably fixed to the chassis, frame with 3.15 mm thick S.S. plate and bolted to chassis frame wherever holes are available in the chassis frame and also with 5/8" 'U' bolts and nuts shall be nylock nuts only.
- (iii) The tank shall be suitably baffled with minimum two nos. of baffles fitted longitudinally and 2 nos. baffles fitted transversely to prevent surge when the vehicle is breaking, cornering or accelerating.
- (iv) The baffles shall be arranged in a manner to facilitate the passage of a man throughout the tank for cleaning purpose.
- (v) The tank shall be mounted on minimum three cross members to counter act the stresses caused by chassis flexion and shall be so secured that it can be easily removed. The water tank shall be provided with six chairs, three on either side for mounting the tank on the runner and chassis frame.
- (vi) The water tank shall be fixed to the chassis frame and runner with 'U' clamps, aluminum packing block, and self-locking nuts.
- (vii) Suitable eyes shall be provided on the shell of the tank to enable it to be lifted from the vehicle for repairs / replacement as and when required.
- (viii) The tank shall be fitted with a 50 mm bore overflow pipe. Two 63 mm instantaneous hydrant connection, incorporating a strainer with NRV, shall be provided close to the pump control panel for filling the tank through 75 mm bore pipe. Minimum 125 mm bore pipeline shall be taken from the tank to the suction inlet of the pump incorporating minimum 125 mm internal diameter butterfly type valve. Drain valve shall be provided at the bottom of the tank.
- (ix) The MS plates used for the tank shall be ZINC PLATED or galvanized and shall be given adequate anti-corrosive treatment of epoxy treatment consisting of one coat of primer with two coats of finish after preparing the surface by sand or shot blasting from inside and outside after fabrication if it is not galvanized. The open end of the overflow pipe should be taken down to a point well below the chassis without affecting the effective ground clearance when fully loaded and shall discharge away from the wheels.
- (x) Visual level gauge of the glass/acrylic tube shall be provided at the control panel calibrated 1/4, 1/2, 3/4 and full (preferably calibrated in liters).
- (xi) The tank shall have a bolted manhole of 60 cm diameter minimum and should have a gunmetal threaded ring and gun metal cap of 30 cm diameter for filling the water tank from the top. The manhole cover shall be made from 3.15 mm thick S.S. plate and epoxy coated from inside and outside. A cleaning hole of at least 25 cm diameter shall also be provided at the bottom.
- (xii) The tank shall be connected with the pump and hose reel and valve(s) shall be provided in such a way that any of the following operations are possible:
  - a) Hydrant - tank,
  - b) Hydrant - reel,
  - c) Tank – pump - high and low pressure hose reels,
  - d) Hydrant – pump - low pressure hose reel, and
  - e) Tank - Pump - Monitor (Foam/Water)
  - f) Off.

### 2.1.6 DELIVERY OUTLETS

There will be 2 Nos. delivery outlets having standard GM inst. female coupling with screw down type delivery valves with blank caps. It will have twist type lugs made of gunmetal.

### 2.1.7 HIGH PRESSURE HOSE REEL

Two high-pressure hose reel to facilitate operation of the high-pressure section of the Fire Pump will be provided and mounted so as to be accessible for use from either side of the appliance. The hose should be prevented from kinking. The hose shall be lightweight PVC nylon braided hose and the working pressure of hose will not be less than 40 kg/cm<sup>2</sup>.

The high-pressure Hose reels will hold not less than 30 M of hose in one length, terminating in High-pressure fog/jet trigger type gun connected by quick connect couplings. The fog gun shall be made of Aluminium alloy or stainless steel (SS 304).

The inlet connection shall have a leak proof rotating type hose connector. The gun shall be of constant flow type and shall have a discharge capacity of 150 LPM approximately. Provision shall be made in the gun controls to achieve combat mode (straight jet) or a fog shield in split second. The gun shall have the ability to work on pressure for 20 kg/cm<sup>2</sup> to 40kg/cm<sup>2</sup> without affecting discharge pattern. The weight of the gun assembly shall not be more than 3 kg.

### 2.1.8 WATER/ FOAM MONITOR

One water cum foam self-aspirating type monitor will be provided on the top at suitable location, with cap. of about 2000 LPM of water @ 7 kg/cm<sup>2</sup>. The monitor will be capable of traversing through 360° in horizontal plane, +75° & -15° in vertical plane with discharge range of 70 M (water). The detailed specification of the Monitor is as under:

Size 75 mm

Body Barrel of SS, GM swivel joint for horizontal & vertical motion manual operation

Rotation 360°

Elevation 90° (+75° -15°)

### 2.1.9 CONSTRUCTION DETAILS

Working pressure 7 kg/cm<sup>2</sup>.

Painting As per IS: 5 (2 coats of red enamel paint)

### 2.1.10 SELF INDUCTION NOZZLE

Material of construction	Aluminium alloy to IS:617 or GM LTB Gr.2 of IS:318.
Type of Foam used	AFF Foam
Discharge capacity	About 2000 LPM
Throw horizontal	Water: min. 60 meters, Foam: min. 50 meters
Foam Expansion	Min. 1:6
Fog (curtain)	160°

K Factor

100.

A suitable pick up tube of min 5 meters long with perforate piercing tube shall be provided along with the monitor.

### 2.1.11 PIPELINES AND VALVES

- (i) All pipelines and pipe fittings shall be of Stainless steel (SS, IS304) and all valves up to 50mm size shall be 3 piece design SS (IS 304) ball valves. All valves above 50mm size shall be standard butterfly valves.
- (ii) All piping shall be sized so as to have minimum pressure drop and achieve the required pressure and flow at various locations.
- (iii) All piping shall be designed for 10% over the maximum pressures encountered in the pipe.
- (iv) The piping shall be flanged for ease of maintenance. However, flange joints shall be kept to minimum.
- (v) All lines shall be hydraulically tested at 1.5 times of the design pressure and pressure shall be held for two hours. In no case the lines shall be tested below 25 kg/sq. cm. (g).
- (vi) All lines shall be suitably supported so as to provide rigidity and avoid vibrations.
- (vii) All lines less than 50 mm NB size can be socket welded to matching rating fittings.
- (viii) All lines above 50mm NB size shall be butts welded with full penetration welds.
- (ix) All bolts, nuts and washers used shall be of SS-IS304.

#### 2.1.11.1 Cooling System

An indirect cooling system of open circuit type heat exchanger shall be provided for cooling the radiator water & Engine. The heat exchanger tank shall be made from minimum 1.22 mm thick brass sheets and the coil in the coolant tank shall be of copper for effective cooling. The design of the heat exchanger shall be such that the temperature of the engine shall not exceed the operating temperature specified by the chassis manufacturer when the vehicle is being used in stationary conditions

### 2.1.12 CONTROL PANEL

Adequately illuminated control panel shall be provided near the pump. The control panel(s) shall include the following features:

- a) Throttle control for engine;
- b) Pressure gauge — 0 to 17.5 kg/cm<sup>2</sup>; for low pressure (glycerin filled)  
Pressure gauge — 0 to 50 kg/cm<sup>2</sup>; for high pressure (glycerin filled)
- c) Compound gauge (glycerin filled) calibrated as under:
  - Vacuum — 0 to 75 cm Hg, preferably in black;
  - Pressure — 0 to 15 kg/cm<sup>2</sup>, preferably in black;
- d) Primer control for exhaust primer
- e) Temperature gauge and glow lamp for lubricating system
- f) Cooling water circuit control.
- g) Water tank valve



- h) Monitor valve
- i) Delivery valves
- j) Suction inlet
- k) Hose reel valves
- l) Water level indicator

### 2.1.13 BODY WORK AND STOWAGE

Enclosed accommodation for six persons shall be provided in the driver cab-cum-crew compartment including the driver and the in-charge of the crew. Both the seats should be independent. The driver's seat should be adjustable and comfortable. The rear compartment of driver's cabin should have one removable seat for full width of cab for 5 (five) crew members. The cab floor should be covered with 3 mm thick Aluminium chequered plate rigidly fixed to the under frame cross members by means of nuts and bolts or riveting except the mudguard arches which shall be covered with 1,60 mm Aluminium chequered plates. Trap doors for topping up oil etc wherever necessary shall be provided.

- (i) One roof light should be provided in the driver's cabin dwell vision and external rear view mirrors should be fitted to the cab. The driver cum crew cabin shall be provided with full four doors, one for driver, and one for officer and two at the crew compartment. The doors shall be generously sized for easy embarking / disembarking of crewmembers. All the doors shall be fitted on the super structural members, each hung upon three invisible coach type M.S. stout hinges and fitted with best quality handles.
- (ii) The door handle on outside of driver seat shall have a locking arrangement. Other doors shall be lockable from inside. In addition to the doors locks, aluminum tower bolt shall be provided for all the doors from inside Adequate grab rails shall be provided for easily boarding and alighting from the appliance.
- (iii) The windscreen glass shall be provided in the two halves and shall be semi-curved type. Each glass shall be fitted in E.P.D.M. rubber beading. The glasses shall be 5 mm thick toughened safety glass.
- (iv) The rubber beading used for fitting glasses and window frame shall be E.P.D.M. rubber.
- (v) The driver seat shall be adjustable type vertically, forward and backward. The officer seat shall be fixed type. Both the seats shall be rigidly fixed to the flooring by means of nuts and bolts.
- (vi) The seat cushion shall be of latex foam rubber 75 mm thick upholstered in good quality foam leather cloth. The back seat shall be of latex foam rubber 50 mm thick upholstered in good quality foam leather cloth.
- (vii) Below the crew seat, two lockers shall be provided one for battery box and another for keeping accessories. The extra length of battery cable if required shall be provided
- (viii) The crew seat shall be rigidly fixed to floor by means of nuts and bolts, running full width of the vehicle suitable for sitting five firemen, covered with 75 mm x 50 mm cushion latex foam rubber upholstered in good quality foam leather of approved shade.
- (ix) The rear body shall be fabricated in continuation and in line. The under frame cross members shall be fabricated from the rolled M.S. channel of 100 x 50 x 5 mm size.

- (x) The M.S. runner of 100 x 50 x 5 mm size shall be provided over the full length of the chassis member for the uniform distribution of load over the chassis.
- (xi) Each cross members shall be secured to the chassis frame by 16 mm diameter 'U' Bolts with aluminum packing block and self-locking unit.
- (xii) Balata packing of thickness 6 mm shall be provided in between the chassis frame and across members.
- (xiii) The structure/frame work shall be of welded constructions and made from 2mm thick MS pressed sections and square tubes. The Angles and channels used shall be of min. 3mm thickness. Zinc plating shall treat for the complete structure material anti corrosion. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The structure shall be so designed so as to avoid any vibration / ratting / deformation in the intended usage of the vehicle.

#### **2.1.14 THE DETAILS OF SUPER STRUCTURE**

- a. Under frame cross members : 100 x 50 x 5 mm (Min.)
  - b. Floor longitudinal members : 50 x 50x 6 mm (Min.)
- 
- (i) The cab and lockers should be of composite construction with sufficient rigidity and reinforcement and shall be kept as light as possible.
  - (ii) The interior paneling shall be done from 1.22mm thick aluminium sheets & the exterior paneling shall be done from 1.60mm thick aluminium sheets.
  - (iii) The roof on the cabin of the vehicle shall be covered with min 1.60mm thick aluminium chequered plates. All the lockers sides & complete rear of the vehicle shall be covered with min. 1.22mm thick aluminium chequered plates. The complete rear deck, all lockers floors, and the rear footboards shall be covered with minimum 3 mm thick aluminium chequered plate.
  - (iv) Sufficient number of Lockers with suitable shelves, partitions and roll in roll out type drawers / trays shall be provided on both sides of the vehicle for secure stowage of all equipment given in annexure. One through and through locker shall be provided immediately behind the drivers cab. All space available below the chassis frame level shall be utilized by providing lockers with proper doors. These doors shall be fitted with suitable chains and hooks on both sides so that the same can be used as footboard.
  - (v) All lockers shall be provided with internal automatic lighting arrangement with the master switch in the cab.
  - (vi) All lockers above chassis floor shall be covered with Aluminium roller shutters. The roller shutters shall be made from extruded aluminium sections with suitable roller, spring, guide channels etc. All aluminium sections used shall be properly anodized.
  - (vii) The Roller shutters shall be rolled inwards underneath the roof giving unobstructed access to the equipment lockers and the fire fighting material.
  - (viii) These roller shutters should open in every position of the vehicle even in rough terrain. Guide rails shall support the shutters over entire length on both sides to make them absolutely torsion free. The roller shutters should have a sturdy lock, preventing accidental opening during movement of vehicle.



- (ix) Roller shutters shall be made of hollow rectangular shaped aluminium links which shall be inter connected with rubber /plastic/ PVC profiles sealing the roller shutter watertight when closed. These roller shutters should be durable, maintenance free, weather and corrosion resistant.
- (x) Suitable storage space shall be provided to store four 2.5-m lengths of suction hoses with couplings at convenient location

#### **2.1.15 SPECIAL PROVISION FOR STOWAGE EQUIPMENT**

For all hose, fittings like branch pipes etc., quick release type couplings are provided which enables the operator to locate the desired equipment instantly and thereby save valuable time at the time of fire. These couplings also ensure that none of the items damage the internal paneling & thereby increase the life of the vehicle. Suitable clamps, brackets, holders etc. are provided for all other items.

#### **2.1.16 MISCELLANEOUS**

- a. A suitable bumper shall be provided at the rear rigidly fixed to the super structural members by means of nuts and bolts which is supplied along with the chassis
- b. Two cat ladders made out of S.S. round or square pipe of 25mm diameter shall be provided.
- c. 2 nos. of 25mm diameter aluminum pipe railing with sufficient number of aluminum double socket brackets shall be provided to the rear body over the deck.
- d. A heavy-duty Towing hook shall be provided and fitted the rear bumper by means of nuts and bolts.
- e. Quick removable type wire mesh guard made from 25x25mm size MS wire mesh of 1.60 mm covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin.
- f. Cable Winch: An electrically operated cable winch of not less than 6.5 tons pulling capacity (single layer) shall be provided. The winch unit should be complete with minimum 5.5 hp, 12v or 24v DC series wound electric reversible motor for pulling operations. The motor and solenoids shall be grounded to the battery. It shall have an automatic load holding brake system for holding the load. For free spooling the clutch design shall be easy to use type with spring loaded pull and rotate system. The gear system should be 3 stage planetary type for faster line speed and the gear reduction ratio shall not be more than 300:1 for maximum duty cycle, the rope drum shall not be of more than 8 inches diameter and shall be supplied with minimum 90 ft heavy duty galvanized wire rope with replaceable self locking clevis hook and shall be mounted on the front bumper of the vehicle with suitable strong supports and a 4 way roller fairlead. Weather resistant clutch housing and solenoid assembly for maximum durability under any weather should be provided. Winch shall be provided with a wireless remote control mechanism for ease of operation.
- g. Telescopic Light Masts: A Pneumatic telescopic mast should be mounted on the vehicle. It should be manufactured from Anodized aluminium 6063 T6 alloy tubes, have a max diameter of 115 mm diameter on its base, and complete with a footplate Ø 150 with up to six fixing holes for bolts. The temperature range shall be from -40 deg. C up to 60 deg. C, with anti-twist lock, with safety valve and drainage outlet valve.

The telescopic mast should be extremely strong and designed with a minimum of 6 sections and it will be equipped with a special plastic locking system placed on the ring between the first and the second section meant to eliminate any backlash between all the sections, once the mast is retracted. The mast will be equipped with an internal spiraled electrical cable with

9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>. For a better movement of the internal cable, the last three internal pistons will be threaded to the corresponding sections. The maximum height of the mast when deployed should be minimum 6000 mm (from the ground), the retracted height should be of maximum 1.900 mm: heights both are meant with the integrated tilt & turn unit. The working pressure cannot be less than 2.5 bar and more than 3.5 bar.

An electro-pneumatic group of valves must be supplied and mounted at the bottom of the mast with the possibility to regulate the extension speed and the retraction speed separately.

The Light mast will have 4 x 1000 Watt Halogen flood light projectors in weatherproof casing. The floodlights on the top should have a minimum electrical rotation of 365° and a tilt of 310°, by means of a tilt and turn unit with an ABS cover for inspection. An electronic PCB (printed circuit board) will be placed inside the tilt & turn unit, controlling all the functions of the mast, like pneumatic up/down, lights on/off, turning, tilting, emergency stop and automatic restore; still inside the tilt & turn unit, but separated from the PCB will be placed the relays for the lighting and switching off of the lights. The lights will be switched on and off in groups of 2+2. Suitable connections for taking permanent Power Supply from generator set through an internal spiral wire mounted inside the mast should be provided.

All the functions of the mast, including extension and return to the original position, lights on/off, automatic restore should be capable of being done through a wired remote control. The same remote control must work without wire (wireless mode) through a male/female connector IP68 which keeps the battery under charge, whenever the remote is plugged and there is tension on the electrical circuit. Every single input given by the user, no matter which, will be confirmed by a visual led and an additional led will confirm the battery status; every single group of 2 lights when switched on will have a corresponding led light on the remote control that will go off only when the lights will be switched off. Every single input given by the user on the remote control will make the whole remote keyboard alight for not less than 15 seconds.

A 5 KVA portable Petrol engine operated GENSET shall be installed at a suitable location in the rear locker and necessary wiring /connections shall be given to the light mast.

### **2.1.17 ELECTRICAL SYSTEM**

- All the important electrical circuit shall have separated fuses suitably indicated and shall be grouped into a common fuse box located at an accessible position. The wiring shall be single pole with negative earth.
- The suitable size wire shall be selected for different circuits considering the current consumption for that circuit.
- Electrical siren of 1.6Kms range 12/24 volts D.C. shall be provided and fitted at suitable place with two controlling push buttons on one officer side and another at Driver side.
- Two rotating beacon lights with Amber lens shall be provided over the top of driver's cabin.
- The other lights, pump cabin light, locker lights shall be of approved make.
- All the controlling switches of lights on dashboard shall be approved make.
- Two fog lamps of approved make shall be provided and fitted on front-bumper with controlling switch on dashboard.

- New wiper motor assembly of 17 watts with new blades and arms shall be provided if not provided with the chassis. The location of wiper motor shall be such that it shall be easily accessible for repairs.
- Adjustable search light assembly shall be provided at a convenient position on the top of rear body deck with 30 meters Cable drum with Rexene cover.
- Hooter cum P.A. system shall be provided with a speaker mounted on the top of Driver's cabin with Rexene cover. The output shall be 25 watts.
- Adjustable spotlight, mounted in a convenient position to give flood or beam of light at the rear of driver cabin shall be provided.

### **2.1.18 PAINTING**

Zinc Plating shall treat for the complete structure material anti corrosion. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The complete external and internal aluminum paneling of driver cum crew cabin and rear body shall be painted with two coats of Zinc Chromate paint. The complete exterior of the vehicle shall be painted with two finish coats of "Post Office Red" polyurethane paint manufactured by ICI Dulux / Nerolac / Dupont or any other brand.

The internal painting of cabin lockers etc. shall be done with two coats of Grey Synthetic enamel paint made by ICI Dulux / Nerolac / Dupont or any other brand. The name of the fire service/organization shall be painted on both sides of vehicle in letter of suitable size in golden yellow paint with black color shading.

The "Emblem" of the department shall be painted on both sides of vehicle in natural colors at suitable place.

### **2.1.19 LADDER WITH GALLOWS**

An aluminium extension ladder of trussed type 10.5 meters height shall be provided with the vehicle and mounted on suitable ladder gallows. The design of the gallows shall be such that the ladder can be released without difficulty from a reasonably accessible position. Means shall be provided for locking the ladder when stowed.

### **2.1.20 B.A. SET BRACKETS**

B.A. set brackets for fixing with its fitments shall be provided just behind the crew seat. The mounting of B.A. set bracket shall be such that, it can allow fireman to wear B.A. set while vehicle is approaching to fire call. Proper padding and harnessing arrangement shall be made in the bracket to avoid damages to the critical parts of the BA set.

### **2.1.21 ACCESSORIES**

The following accessories shall be provided.

- (i) Fire Bell: (Bell Carillon) : One Gun metal fire bells of 250 mm size conforming to IS 1928 of 1984 shall be mounted externally on the top of crew compartment and shall be operated within the crew compartment by firemen in seating position.
- (ii) Six aluminum hooks for keeping the uniform clothing shall be provided in crew compartment.
- (iii) Wireless Set Box: Box made from 2 mm gauge aluminum sheet with lid shall be provided just behind the officer seat with 13mm wooden plank for fitting the wireless set bracket. The design and mounting will be shown at the time of fabrication work.

- (iv) Workmanship and Finish: The GVW of appliance will not cross the GVW of chassis manufacturer's specification with all equipments & Crew. The weight distribution diagram should be submitted for approval. The entire appliance will be painted fire red on the outside. The user name will be written on both-side with yellow color. Before final painting of Fire Tender, two coats of anti corrosion and primer coat will be applied.

The appliance will clearly have the following markings at suitable locations.

- Manufacturers name and Trade mark.
- Engine and Chassis No.
- Pump No. and capacity of the pump.
- Capacity of Water tank, Foam tank
- All instruments control will be identified with nameplates

### 2.1.22 ACCEPTANCE TESTS

The following acceptance test will be given to the complete satisfaction of the user. The design of vehicle will be such that it will not affect the Chassis Characteristic as specified by the chassis manufacturer such as speed, turning circle, acceleration, braking distance etc.

The stability of the appliance will be such that when under fully equipped & laden condition, if the surface on which the appliance stands is tilted to either side, the point at which over turning occurs is not passed at an angle of 27° from horizontal. This test should be carried out at the vendor factory in front of all the inspecting officers.

- i) The pump with its all fitments will be subjected to Hydrostatic testing on a pressure of 21 kg/cm<sup>2</sup>
- ii) The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of mechanical carbon seal. After this test, there shall not be any leakage of water through carbon seal.
- iii) The pump will be subjected to Endurance test for a period of 4 hours continuous running. The first Three hours the pump shall deliver rated output of 2000 LPM at 8 kg/cm<sup>2</sup> and next one hour will be 300 LPM at 35 kg/cm<sup>2</sup>.
- iv) During the endurance test the water shall not be replenished in the cooling system and the temperature of the cooling water and engine oil should not exceed the manufacturers' standards recommendations for the continuous operation and engine should not show any sign of stresses.
- vi) The other tests shall be as per detailed performance parameters given for chassis, superstructure, and firefighting system, which include monitor output & throw, foam induction & expansion, load etc. Accessories shall also be subjected to relevant tests as per the specification indicated above.

List of mandatory and optional accessories are recommended in **Table 2-1** and **Table 2-2**, respectively.

**Table 2-1: List of Mandatory Accessories recommended for Water Tender**

SL. No.	ITEM	QUANTITY
1.	100 mm rubber suction hose in 2.5 meters length with 100 mm suction hose GM couplings as per IS: 3549-1983	4 NOS
2.	Suction collecting head – 100mm suction inlet, GM 2 way as per IS: 904: 1983	1 no

SL. No.	ITEM	QUANTITY
3.	Suction strainer for 100mm suction hose – brass as per IS: 907: 1984	1 no
4.	Dividing breaching with control 63mm instantaneous pattern – GM as per IS: 5131: 2002	1 no
5.	Collecting breaching 63mm instantaneous pattern – GM as per IS: 905: 1980	1 no
6.	Suction wrenches for 100 mm suction hose couplings as per IS: 4643: 1984	2 nos
7.	Combined key for hydrant cover and lower valve as per IS: 910: 1980	2 nos
8.	Hose straps as per IS: 5612: 1977 part I	6 nos
9.	Branch with revolving head, GM, 63mm size as per IS: 906: 1988	1 no
10.	Nozzle plain of various sizes for 63mm (12, 19, mm) IS 903 – 1993	1 each
11.	Torch electric with 4 cell water proof	2 nos
12.	Flame proof torch (approved by CCOE)	2 nos
13.	Foam branch – FB5X type with pick up tube, GM as per IS: 2097: 1983	2 no
14.	Rope polyamide 32mm diameter for lowering line of 30mtr long with sealed	1 no
15.	Rope polyamide 12mm diameter for guy line of 30 meter long with sealed ends	1 no
16.	Rope polyamide 24mm diameter for long line of 30 meter long with sealed ends	1 no
17.	Rope polyamide 22mm diameter for short line of 20 meter long with sealed	1 no
18.	Hose bandages as per IS: 5612: 1977 part 2	4 nos
19.	Hose slings as per IS	2 nos
20.	Rubber gloves as per IS 4770-1991 for 5000Volts	4 pairs
21.	Leather gloves IS 6994 – 1977 PART 1	2 pairs
22.	Canvas gloves with anti skid palm	2 pairs
23.	Axe large as per IS: 963: 1963	2 nos
24.	Pick axe as per IS: 703: 1968	1 no
25.	Firemen Axe as per IS: 926	1 no
26.	Spade with wooden handle	1 no
27.	Crow bar of 6 ft long 25mm diameter as per IS: 704: 1968	2 nos
28.	Spanner adjustable, 30cm long	1 no
29.	Jack Hydraulic for 20 ton capacity with handle	1 no
30.	Oil feeder standard capacity	1 no
31.	Funnel 300mm diameter made from GI 18SWG sheet	1 no

SL. No.	ITEM	QUANTITY
32.	Hammer sledge with wooden handle – 10 kg	1 no
33.	Hammer sledge with wooden handle – 5 kg	1 no
34.	Suction adaptor GM 100mm female x 63mm male with lugs	1 no
35.	Adaptor 63mm male to 38mm female GM	2 nos
36.	Adaptor 63mm female to 63mm female GM	1 no
37.	Tool kit - PARATECH PRT Kit (Hand held forcible entry tool kit)	1 no
38.	Belt hook	1 no
39.	Selectable flow nozzle, made of aluminium alloy (hard anodized), light weight and easy handling having 63 mm size male instantaneous inlet. Nozzle shall have rubber-molded bumper and pistol grip handle, ball valve with shut off handle. Selectable flow capacity, nozzle flow rate settings of approx. 200-250-350-475-600 lpm at 7 kg/cm <sup>2</sup> , with good range hollow jet, and dense fog in spray position and having a arrangement of low and medium expansion foam attachment.	3 no
40.	Branch pipe GM 63mm male inlet as per IS: 903: 1993	1 no
41.	Sand bag canvas, round shape, 300 mm diameter, 450mm length with cotton rope for closing mouth	2 nos
42.	Cap hydrant spindle	1 no
43.	Cap hydrant spindle new pattern	1 no
44.	Chisel cold	2 nos
45.	Hose clamp as per IS standard	4 nos
46.	Bolt cutter – 600mm long –	1 no
47.	Hammer ball pein – 500 gms	1 no
48.	Hook ceiling (preventer) with 3mtr.long wooden handle	1 no
49.	Hook anchor	1 no
50.	Knife salvage	1 no
51.	Tyre lever	1 no
52.	Pliers cutting	1 no
53.	Pliers insulated	1 no
54.	Petrol Chain saw machine, 600 mm guide bar length, with spare chain.	1 no
55.	Rake three prong	1 no
56.	Hose ramp (rubber) as per IS standard 20 ton capacity suitable for 2 lines	4 nos
57.	Saw carpenter – 300mm	1 no



SL. No.	ITEM	QUANTITY
58.	Combi-tool with integrated Hand operated pump The Minimum spreading force at the tips in closed position shall not be less than 2.5 tons. Maximum spreading force shall not be less than 20 tons. The handle and not the head shall be able to be rotated to 180 degree. Spreading distance at the tips shall not be less than 260 mm. It should be capable of Cutting 24 mm steel bars (average hardness of steel 500 to 550 mpa) The maximum cutting force shall not be less than 250 KN and the Weight of ready to use unit should not be more than 11 kg	1 no
59.	Shovel with handle	1 no
60.	Nozzle spanner as per IS standard	1 no
61.	Strainer wicker with canvas hood	1 no
62.	Canvas Bucket	2 nos.
63.	Crow Bar 4 feet	1 no.
64.	Crow Bar 6 feet	1 no.
65.	Delivery hose 63 mm diameter conforming to IS 636-1988 Type A in 30 meters length with SS male and female couplings. The hose and the couplings should be ISI marked.	10 nos.
66.	B A Set as per BIS standards.	2 nos.

**Table 2-2: List of optional accessories recommended for water tender**

SL.N O.	ITEM	QUANTITY										
1	Inflatable lighting tower with inbuilt 4-stroke petrol engine driven generator of 1200 VA with 400 watts high-pressure Metal halide lamp, inflatable height of 4 meters with 2 blowers for balloon inflation. It should be possible to use the unit through AC mains. Weight not more than 45 kgs	1 No.										
2	<p>Jumping cushion - The jumping rescue cushions should have high reliability, shall be easy to handle, and shall be capable of being fully erected by 4 to 6 persons. The possible jumping height shall not be less than 30 meters. It shall have illumination for night operations and shall be capable of being used in dusty conditions. The detailed technical specifications are as under:-</p> <table><tr><td>Shape</td><td>8 corner shape (octagonal)</td></tr><tr><td>Outer Dimensions</td><td>Not less than 5.50 X 5.50 meters</td></tr><tr><td>Usable jumping area</td><td>Not Less than 4.50 X 4.50 meters</td></tr><tr><td>Jumping angle (30m height)</td><td>9.74°</td></tr><tr><td>Tube diameter of the inflatable frame</td><td>22 cm ( 0,22 meters)</td></tr></table>	Shape	8 corner shape (octagonal)	Outer Dimensions	Not less than 5.50 X 5.50 meters	Usable jumping area	Not Less than 4.50 X 4.50 meters	Jumping angle (30m height)	9.74°	Tube diameter of the inflatable frame	22 cm ( 0,22 meters)	1 no
Shape	8 corner shape (octagonal)											
Outer Dimensions	Not less than 5.50 X 5.50 meters											
Usable jumping area	Not Less than 4.50 X 4.50 meters											
Jumping angle (30m height)	9.74°											
Tube diameter of the inflatable frame	22 cm ( 0,22 meters)											

SL.N O.	ITEM	QUANTITY
	Material of frame Material of outer cover Material of jumping area Compressed air cylinders Erection time Re-election after a jump Weight of the complete device (with charged cylinders) Packing	Natural rubber reinforced with polyester fabric 940 dtex, black Fire retardant special PVC-coated polyester fabric, orange Fire retardant special PVC-coated polyester fabric, white with black markings 2 x 6l/300bar or equivalent steel cylinders Not more than 75 sec. (depending on the used cylinders) Not more than 10 sec. Not more than 150 kg It Shall be packed in a valise with handles for 6 persons
3	Protective clothing for firemen complete with gloves, boots, helmets with suitable face shield made out of materials capable of reflecting at 1500 to 2000 & also afford some protection against direct flame. The suit will be of sufficient to accommodate breathing apparatus for user.	2 SET
4	A portable fire pump (Centrifugal) made from Aluminium alloy material with SS main shaft having rated performance of 1600 LPM at 7 kg/cm <sup>2</sup> while working on 3M static suction lift at NTP shall be provided. A self-contained minimum 50 hp 2/4-stroke petrol engine with cooling system and push button/standby hand recoil start system shall power the pump. The pump shall be lightweight for easy handling. The pump shall have two-delivery outlet/s of 63mm diameter (BIS standard) with instantaneous couplings and 100 mm suction inlet with blank cap. The primer shall be either Exhaust ejector type or Rotary type or automatic piston type, capable of lifting the water from the depth of 7 meters within 30 seconds. The pump and engine shall be mounted on SS carrying frame with four folding handles. The fuel tank capacity shall be adequate to run the pump for min. one hour delivering full rated output. The pump shall be mounted in one of the locker with suitable roll in/out arrangement. All necessary instruments, controls, levers, lights, switches etc shall be provided. The weight of the pump should not be more than 90kg.	1 no.

*Note: It should be noted that few of the accessories mentioned above has not been included in the cost estimation for Water Tender, as the cost for these accessories has been estimated separately.*

## 2.2 Mini Water Tender

Approximate Cost: Rs. 25 Lakhs

The fabrication of mini water tender should be generally conforming to IS950/80 & as per the technical details given below:





The top of the body & rear of the body shall be paneled with 18 SWG aluminum chequered plates. The outside paneling shall be fixed by means of rivets contrary to spot welding, points of attack for any kind of corrosion.

### **2.2.6 SPECIAL PROVISION FOR STOWAGE OF EQUIPMENTS**

For all water fittings like Branch Pipes etc. Quick release couplings shall be provided which will enable the operator to locate the desired equipment instantly & thereby save valuable time at the time of fire. These couplings shall also ensure that none of the items damage the internal paneling & thereby increase the life of the vehicle. Suitable clamps, brackets, holders etc. are to be provided for all other items.

### **2.2.7 TELESCOPIC LIGHT MASTS**

A Pneumatic telescopic mast should be mounted on the vehicle. It should be manufactured from Anodized aluminum 6063 T6 alloy tubes and have a max diameter of 115 mm diameter on its base and complete with a footplate Ø 150 with up to six fixing holes for bolts. The temperature range shall be from -40° C up to 60° C, with anti-twist lock, with safety valve and drainage outlet valve.

The telescopic mast should be extremely strong and designed with a minimum of 6 sections and it will be equipped with a special plastic locking system placed on the ring between the first and the second section meant to eliminate any backlash between all the sections, once the mast is retracted. The mast will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>. For a better movement of the internal cable, the last three internal pistons will be threaded to the corresponding sections. The maximum height of the mast when deployed should be minimum 6000 mm (from the ground), the retracted height should be of maximum 1.900 mm: heights both are meant with the integrated tilt & turn unit. The working pressure cannot be less than 2.5 bar and more than 3.5 bar.

An electro-pneumatic group of valves must be supplied and mounted at the bottom of the mast with the possibility to regulate the extension speed and the retraction speed separately.

The Light mast will have 4 x 1000 Watt Halogen flood light projectors in weatherproof casing. The floodlights on the top should have a minimum electrical rotation of 365° and a tilt of 310°, by means of a tilt and turn unit with an ABS cover for inspection. An electronic PCB (printed circuit board) will be placed inside the tilt & turn unit, controlling all the functions of the mast, like pneumatic up/down, lights on/off, turning, tilting, emergency stop and automatic restore; still inside the tilt & turn unit, but separated from the PCB will be placed the relays for the lighting and switching off of the lights. The lights will be switched on and off in groups of 2+2. Suitable connections for taking permanent Power Supply from generator set through an internal spiral wire mounted inside the mast should be provided.

All the functions of the mast, including extension and return to the original position, lights on/off, automatic restore should be capable of being done through a wired remote control. The same remote control must work without wire (wireless mode) through a male/female connector IP68 that keeps the battery under charge, whenever the remote is plugged and there is tension on the electrical circuit. Every single input given by the user, no matter which, will be confirmed by a visual led and an additional led will confirm the battery status; every single group of 2 lights when switched on will have a corresponding led light on the remote control that will go off only when the lights will be switched off. Every single input given by the user on the remote control will make the whole remote keyboard alight for not less than 15 seconds.

A 5 KVA portable Petrol engine operated Genset shall be installed at a suitable location in the rear locker and necessary wiring /connections shall be given to the light mast

### **2.2.8 CABLE WINCH**

An electrically operated cable winch of not less than 6.5 tons pulling capacity (single layer) would be provided and mounted in the front of the vehicle. The winch unit should be complete with minimum 5.5 hp, 12v DC series wound electric reversible motor for increased pulling power. The motor and solenoids shall be grounded to the battery. It shall have an automatic load holding brake system for more strength. For free spooling, the clutch design shall be easy to use type with spring-loaded pull and rotate system. The gear system should be 3 stage planetary type for faster line speed and the gear reduction ratio shall not be more than 300:1, the rope drum shall not be of more than 8 inches diameter and shall be supplied with minimum 90 ft heavy duty galvanized EIPS wire rope with replaceable self locking clevis hook and would be mounted on the front bumper of the vehicle with suitable strong supports and a 4 way roller fairlead. The Weight of the winch shall not be more than 55 kg

### **2.2.9 LADDER GALLOWS**

Gallows to carry trussed type of aluminum extension ladder of 7.5 meters extended length shall be provided with rollers so that it can be operated easily & instantly by 1 man. Arrangement shall be incorporated for locking the ladder when stowed.

### **2.2.10 CONTROL PANEL**

An adequately illuminated control panel is provided at the rear of the appliance which includes the following:

↳ Pressure gauge    ↳ Compound gauge    ↳ Throttle control    ↳ Primer control

### **2.2.11 COOLING SYSTEM**

Indirect cooling system of open circuit type is provided incorporating a heat exchanger with copper coils to ensure that the engine temperature does not exceed the rated temperature specified by the chassis manufacturer.

### **2.2.12 HOSE REEL**

A First Aid Hose reel with 60M length of 20 mm diameter hose & shut off nozzle shall be provided at suitable location and shall be worked through the Fire Pump at the rear.

### **2.2.13 ACCESSORIES**

The following accessories shall be fitted / provided on the appliance.

- Fire bell - hand operated.
- A two tone hooter with PA system.
- Fog lamps
- Reversing lights
- Emergency blinker light
- Searchlight fixed on appliance with 30 M wire reel.

**Table 2-3: List of Mandatory Accessories/Equipment recommended for Mini Water Tender**

Sl.No.	Item	Quantity
1. 1	100 mm rubber suction hose in 2.5 meters length with 100 mm suction hose GM couplings as per IS: 3549-1983.	4 Nos
2.	Suction collecting head – 100mm suction inlet, GM 2 way as per IS: 904: 1983	1 no
3.	Suction strainer for 100mm suction hose – brass as per IS: 907: 1984	1 no
4.	Dividing breaching with control 63mm instantaneous pattern – GM as per IS: 5131: 2002	1 no
5.	Collecting breaching 63mm instantaneous pattern – GM as per IS: 905: 1980	1 no
6.	Suction wrenches for 100 mm suction hose couplings as per IS: 4643: 1984	2 nos
7.	Branch with revolving head, GM, 63mm size as per IS: 906: 1988	1 no
8.	Nozzle plain of various sizes for 63mm (12, 19, mm) IS 903 – 1993	1 each
9.	Rope polyamide 12mm diameter for guy line of 30 meter long with sealed ends	1 no
10.	Rope polyamide 22mm diameter for short line of 20 meter long with sealed ends	1 no
11.	Selectable flow nozzle, made of aluminum alloy (hard anodized), light weight and easy handling having 63 mm size male instantaneous inlet. Nozzle shall have rubber-molded bumper and pistol grip handle, ball valve with shut off handle. Selectable flow capacity, nozzle flow rate settings of approx. 200-250-350-475-600 lpm at 7 kg/cm <sup>2</sup> , with good range hollow jet, and dense fog in spray position and having a arrangement of low and medium expansion foam attachment. (weight 3 kgs maximum)	3 no
12.	Branch pipe GM 63mm male inlet as per IS: 903: 1993	1 no
13.	Axe large as per IS: 963: 1963	1 no
14.	Pick axe as per IS: 703: 1968	1 no
15.	Firemen Axe as per IS: 926	1 no
16.	Spade with wooden handle	1 no
17.	Crow bar of 6 ft long 25mm diameter as per IS: 704: 1968	1 no
18.	Spanner adjustable, 30cm long	1 no

Sl.No.	Item	Quantity
19.	Hammer sledge with wooden handle – 5 kg	1 no
20.	Suction adaptor GM 100mm female x 63mm male with lugs	1 no
21.	Adaptor 63mm male to 38mm female GM	2 nos
22.	Adaptor 63mm female to 63mm female GM	1 no
23.	Hand held Forcible entry tool – Paratech PRT kit	1 no
24.	Bolt cutter – 600mm long	1 no
25.	Nozzle spanner as per IS standard	1 no
26.	Delivery hose 63 mm dia conforming to IS 636-1988 Type A in 30 mtrs length with SS male and female couplings. The hose and the couplings should be ISI marked.	6 nos.

## 2.3 Water Bowser

Approximate Cost: Rs. 30 Lakhs.

Water scarcity for firefighting has been experienced for quite some time in many part of India. It was, therefore, accepted that the provision of heavy-duty water bowser should be made at major fire stations. These water bowzers are proposed to be self-sufficient to supply water to front runner firefighting fleet or extinguish fire at its own. The provisions of such water bowser are strongly recommended at all bigger fire stations in the area of water scarcity, fire stations where water has corrosive properties and fire stations near industrial areas.

### 2.3.1 CHASSIS

The chassis shall be suitable to carry minimum 25 tons G V W, 6x4, having wheel base of 4600 mm,. The engine fitted on the chassis shall comply the respective emission norms in force at the time of delivery of chassis. The chassis shall be brand new with the following specifications.

- (i) Engine : 6 cylinders in-line water cooled, turbo charged, diesel inter cooled  
 engine  
 developing not less than 250 bhp and conforming to prevalent  
 emission norms
- (ii) Clutch : Single plate dry friction type hydraulically actuated.
- (iii) Gear Box : Synchromesh gearbox with crawler gear.
- (iv) Front Axle : Heavy duty, forged, 'I' beam.
- (v) Rear Axle : Hub reduction, hypoid gears, fully floating axle shaft with tandem  
 axle,  
 axle lock between the axles.
- (vi) Steering : Integral hydraulic power assisted steering
- (vii) Brakes : Dual circuit fully air braking system with pneumatically operated  
 parking  
 brakes on rear wheels.
- (viii) Suspension : Semi- elliptical leaf spring at front and rear with hydraulic double  
 acting  
 shock absorber on front.
- (ix) Frame : Ladder type heavy duty frame with riveted / bolted cross members.
- (x) Wheels and Tyres : As per manufacturers' design– 11 Nos. (including spare  
 wheel)
- (xi) Fuel Tank : Minimum 160 liters capacity.
- (xii) Electrical System : 12/24 volts. 120 Ah capacity battery with Alternator.
- (xiii) Cowl : Standard cowl duly painted in RED color with instrument  
 cluster,  
 rear view mirrors, Wiper system original driver seat, safety  
 belts.

- (xiv) GVW : Not more than 25000 Kg  
(xv) Safety features : Anti Lock Breaking System (ABS)

### 2.3.2 WATER TANK

The capacity shall be minimum 12000 liters. The tank body and baffles shall be of minimum 3.15 mm thick S.S. plates (IS 304). The tank shall be elliptical in shape with dished ends. The tank shall be mounted behind the drivers' cabin with min, 150 mm gap between the cabin and the tank.

A tank of required capacity constructed out of mild steel treated for anti-corrosion shall be suitably mounted on the chassis in a manner keeping in view the proper load distribution on the axles.

A full length runner from behind the driver cabin till end of chassis frame shall be provided and made out of S.S. Channel of 100 x 50 x 3.15 mm suitably fixed to the chassis, frame with 6 mm thick M.S. plate and bolted to chassis frame wherever holes are available in the chassis frame and also with 16mm 'U' bolts and nuts shall be nylock nuts only.

The tank shall be suitably baffled with minimum 3 nos of baffles fitted longitudinally to prevent surge when the vehicle is breaking, cornering or accelerating. The baffles shall be arranged in a manner to facilitate the passage of a man throughout the tank for cleaning purpose.

The tank shall be mounted on minimum Five cross members to counter act the stresses caused by chassis flexion and shall be so secured that it can be easily removed. The water tank shall be provided with ten chairs, five on either side for mounting the tank on the runner and chassis frame.

The water tank shall be fixed to the chassis frame and runner with 'U' clamps of 16 mm diameter with aluminum packing block and self-locking nuts. Suitable eyes shall be provided on the shell of the tank to enable it to be lifted from the vehicle for repairs / replacement as and when required

The tank shall be fitted with a 75 mm bore overflow pipe. 2 nos. of 63 mm instantaneous hydrant connection, incorporating a strainer with NRV, shall be provided close to the pump panel control for filling the tank through 75 mm bore pipe work or feeding the hose reel equipment. Minimum 100 mm bore pipeline shall be taken from the tank to the suction inlet of the pump incorporating minimum 100 mm quick action Butterfly type valve. Separate valve(s) for performing the function given above shall be provided to control the flow of water to the hose reel equipment. Drain plugs or drain cocks shall be provided wherever necessary.

The MS plates used for the tank shall be Zinc Plated or galvanized and shall be given adequate anti-corrosive treatment of epoxy treatment consisting of one coat of primer with two coats of finish after preparing the surface by sand or shot blasting from inside and outside after fabrication if it is not galvanized. The open end of the overflow pipe should be taken down to a point well below the chassis without affecting the effective ground clearance when fully loaded and shall discharge away from the wheels.

Visual level gauge of the glass / acrylic tube shall be provided at the control panel calibrated 1/4, 1/2, 3/4 and full (preferably calibrated in liters).

The tank shall have two nos bolted manhole of 60 cm diameter minimum and should have a gunmetal threaded ring and Gun Metal cap of 30 cm diameter for filling the water tank from the top. The manhole cover shall be made from 5 mm thick M.S. plate and epoxy coated from inside and outside. A cleaning hole of at least 25 cm diameter shall also be provided at the bottom.



The tank shall be connected with the pump, hose reel, and valve shall be provided in such a way that any of the following operations are possible:

- Hydrant - tank,
- Hydrant - reel,
- Tank – pump - Hose reel,
- Hydrant – pump - Hose reel, and
- Off.

### 2.3.3 MONITOR

One water monitor will be provided on the top at suitable location, with cap. of about 3,000 LPM of water @8.5 kg/cm<sup>2</sup>. The monitor will be capable of traversing through 360° in horizontal plane, +75° & -15° in vertical plane with discharge range of 70M (water). The detailed specifications of the Monitor is as under-

Size	: 100 mm
Body	: Barrel shall be made of SS IS304 pipes and pipe fittings with GM / SS swivel joint for horizontal & vertical motion.
Operation	: Manual Operation.
Rotation	: 360°.
Elevation	: 90°. (+75° -15°)
Discharge capacity	: 3000 LPM
Throw at 8.5 kg/cm <sup>2</sup>	: Water min. 70 meters.

### 2.3.4 PUMP

The pump shall be centrifugal type, multi pressure, having output capacity of about 2,270 LPM at 7 kg/cm<sup>2</sup> and about 300 LPM at 40 kgs/cm<sup>2</sup> at 3 meters suction lift at NTP condition. The low-pressure side will be of single stage and the high-pressure side also with single stage having regenerative type impeller.

The pump shall comply to the following performance parameters:

- a) Normal Pressure output : about 2,270 LPM at 7 kg/cm<sup>2</sup>
  - b) High pressure output : about 300 LPM at 40 kg/cm<sup>2</sup>
  - c) Maximum pressure in : 14 kg/cm<sup>2</sup> (shut off pressure)  
normal pressure mode.
  - d) Maximum pressure in : 45 kg/cm<sup>2</sup>  
High-pressure mode
  - e) Deep lifting capacity of pump : 30 cm/sec max up to 7m in 30 sec at NTP condition.
- (i) The overall pump shall be constructed from gunmetal. The normal (low) pressure impeller, volute, and impeller wearing shall be made from gunmetal conforming to Gr II of IS 318/1981 and the regenerative type high pressure impeller shall be of Aluminum, Bronze (AB-2). The pump shaft shall be made from stainless steel conforming to IS 6603/1972. The bearing housing will be made of C.I. and all the studs and bolts coming in contact with water shall be of stainless steel. The bearings used in the pump shall be of reputed make.



- (ii) The normal and high-pressure impeller shall be mounted on a single shaft and normal (low) pressure impeller shall be dynamically balanced.
- (iii) The pump shall be provided with self-adjusting mechanical carbon seal with interface plate. The mechanical seal assembly shall stand dry running of pump up to 2 minutes without any damages.
- (iv) The pump shall be provided with an inbuilt filter of easily removable type, which shall filter the water before entering into the high-pressure stage impeller.
- (v) Operation of low pressure to high pressure or vice-a-versa shall be possible by actuation of single lever.
- (vi) The pump shall have facility to operate low pressure and high-pressure mode simultaneously or individually. While high-pressure mode is in operation and delivering 300 LPM at 40 kg/cm<sup>2</sup>, the pressure in low-pressure side shall not exceed 8.5 kg/cm<sup>2</sup>.
- (vii) The pump shall be provided in built (integrated in the pump outlet manifold) Pressure Relief Valve (PRV) which shall operate automatically and shall not allow the high pressure to increase beyond 45 kgs/cm<sup>2</sup>.
- (viii) The size of high-pressure outlet shall be of 25 mm connected to high-pressure hose reel.
- (ix) The Thermal Relief Valve (TRV) shall be provided and fitted in the pump housing, which will open when both deliveries (HP and LP) are shut off for longtime to control the temperature of pump water. The Thermal Relief Valve (TRV) should open at 60 deg Celsius and shall reset automatically when the temperature of water is within limit.
- (x) The pump design shall be modular type and shall not have gaskets/packing. The arrangement shall be such that the carbon seal can be attended / removed without removing the pump body. The pump shall be provided deep groove heavy-duty dual angular contact bearing immersed in oil bath.
- (xi) The pump shall be provided with one suction inlet of 125 mm dia. having round threads conforming to IS:902 of 1974 and three numbers of 63 mm delivery outlets having screw down type valves fitted with instantaneous couplings as per IS 903/1993. The delivery valve spindle sealing shall not be of gland type. The high-pressure outlet shall not be less than 25 mm and shall either be flange on screw type.
- (xii) The efficiency of the pump shall be such that the power and RPM required shall not be more than available with the engine.
- (xiii) The pump housing shall have provision to connect to internal cooling system.
- (xiv) The pump shall be mounted at the rear of the vehicle connected to P.T.O. by propeller shafts and universal and slip joints with sufficient number of bearing supports.
- (xv) Pump primer – The priming system shall be horizontal Reciprocating type integrated in pump bearing housing. The priming shall be fully automatic in operation and shall not require any operation whatever from the pump operator other than throttling the engine to the required RPM. The primer shall get automatically disengaged once the pump is registered the pressure. The primer shall be capable of lifting the water in 30 seconds from the depth of 7 meters. (up to pump inlet) at NTP condition. The pump shall attain a dry vacuum of 620 mm of Hg. The reciprocating pistons shall be made up of stainless steel and reciprocate in self-lubricated linear bearings. The

cylinder and priming valve housing shall be made from gunmetal. The eccentric cam shall be fitted on pump main shaft to operate the pistons with neoprene rubber inlet and outlet valves. The primer shall disengage automatically at a pump pressure of 1.5 to 2.0 kg/cm<sup>2</sup>.

- (xvi) In addition, Exhaust ejector type primer capable of lifting water from 7 meters within 30 seconds shall also be provided.

### **2.3.5 PUMP TEST**

The pump fitted on the vehicle shall be subjected to various test as detailed below-

- (i) The pump with its all fitments will be subjected to Hydrostatic testing on a pressure of 21 kg /cm<sup>2</sup> .
- (ii) The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of mechanical carbon seal. After this test there shall not be any leakage of water through carbon seal.
- (iii) The pump performance test will be carried out by running the pump at constant RPM at 2600 and measuring the discharge at various pressures.
- (iv) The pump will be subjected to Endurance test for a period of FOUR hours continuous running. The first Three hours the pump shall deliver rated output of 3000 LPM at 8 kg/cm<sup>2</sup> and next one hour will be 300 LPM at 35 kg/cm<sup>2</sup>.
- (v) During the endurance test the water shall not be replenished in the cooling system and the temperature of the cooling water, engine oil should not exceed the manufacturer's standards recommendations for the continuous operation, and engine should not show any sign of stresses.
- (vi) Foam induction test to check the calibration of metering valve.
- (vii) Foam production test with monitor and side lines for foam quality.

### **2.3.6 POWER TAKE OFF**

The P.T.O shall be Heavy-duty type of suitable ratio capable of transmitting the full torque of the engine in first gear. The lever for engaging the P.T.O. shall be provided in the Driver's cabin with proper locking arrangement. The PTO shall be mounted on heavy duty cross members and support brackets between the longitudinal members of the chassis frame. Means shall be provided to check the oil level in the PTO and suitable drain plug shall be provided at the bottom. A cooling coil made of copper tubes shall be provided inside the PTO at the bottom to prevent the oil of the PTO from heating.

### **2.3.7 COOLING SYSTEM**

An indirect cooling system of open circuit type heat exchanger shall be provided for cooling the radiator water & Engine. The heat exchanger tank shall be made from minimum 1.22 mm thick brass sheets and the coil in the coolant tank shall be of copper for effective cooling. The design of the heat exchanger shall be such that the temperature of the engine shall not exceed the operating temperature specified by the chassis manufacturer when the vehicle is being used in stationary conditions.

### **2.3.8 COLONEL PANEL**

Adequately illuminated control panel shall be provided at suitable place having following controls.

- a) Throttle control for engine;

- b) Pressure gauge — 0 to 17.5 kg/cm<sup>2</sup>; (Glycerin filled)
- c) Pressure gauge --- 0 to 50.0 kg/cm<sup>2</sup> (Glycerin filled)
- d) Compound gauge (glycerin filled) calibrated as under:
  - Vacuum — 0 to 75 cm Hg, preferably in black;
  - Pressure — 0 to 15 kg/cm<sup>2</sup>, preferably in black;
- e) Primer control for Exhaust Ejector Primer
- f) Engine Temp. Gauge and glow lamp for lubricating system
- g) Cooling water circuit control
- h) Pump to monitor valve
- i) Water tank Valves
- j) Monitor valve
- k) PTO lever

### 2.3.9 STOWAGE

There shall be adequate lockers space on both sides for stowage of hosepipes, GM parts, small gears & other miscellaneous safety gears, rescue tools & equipments. Access to the Diesel tank would be through an opening near diesel tank for filling by a cut out in side paneling and to facilitate dip measurement of the Diesel in the tank.

### 2.3.10 BODY FABRICATION

Cross members will be of MS Rolled channels of size 100X50X5mm duly bolted to runner mounted on the main chassis frame with high tensile bolts with anti chafe packing. A M.S. runner of 100 x 50 x 5 mm size shall be provided over the full length of the chassis member for the uniform distribution of load over the chassis.

- (i) The entire structure will be framed in such a way so as to ensure a strong and rigid structure.
- (ii) The inner lockers structure will be of 35 mm X 3 mm MS rolled angles duly gusseted & strengthened for sturdiness.
- (iii) All lockers floors will be laid with 1.60mm Aluminum chequered plate. Lockers side would be paneled with 1.2mm Aluminum chequered plates.
- (iv) The entire vehicle will be paneled from outside with 1.60mm Aluminum sheets except the water tank.
- (v) No MS Sheets would be used for either body paneling or to the lockers.
- (vi) All lockers should be covered with doors / Aluminum Roller Shutters.
- (vii) Roller shutters are rolled inwards underneath the roof giving unobstructed access to the equipment lockers and the firefighting material.
- (viii) These roller shutters should be open in every position of the vehicle even in rough terrain. Guide rails support the shutters over entire length on both sides. This makes them absolutely torsion free.
- (ix) Roller shutters should have a sturdy lock, preventing accidental opening during movement of vehicle.

### 2.3.10.1 Cabin

Enclosed accommodation for 2 persons shall be provided in the Driver cab including the Driver and one crew member. One door on each side would be provided on the Driver-co-driver compartment. The doors shall be hinged opening on wards & shall be hung forward & will have catch locks and flush type handles.

- The cabin shall be paneled externally with 1.60mm Aluminum sheets & 1.22 mm internally with aluminum sheet. The two doors will be fitted with toughened glasses & winding type regulators. One roof light will be provided in the Drivers cabin Grab-rails & non-slip steps would be provided wherever necessary. Rear view Mirrors would be fitted on the outside of the cabin on both the sides.
- Toughened large windscreen glasses semi curved type shall be provided for better visibility.
- The entire cabin floor shall be covered with 1.60mm Aluminum chequered plates. The cabin roof inside shall be covered with 1.2mm Aluminum sheets.
- An electronic siren shall be provided, operable from cabin and suitably mounted on roof so that does not obstruct the movements of monitor.
- A small search light of 50W power would be provided on the Driver's cabin dashboard.
- Wire mesh guards will be provided to front windscreen glass & side door glasses (2 Nos.). These wire mesh guards would be of removable type.

### 2.3.11 ELECTRICAL SYSTEM

1. All important electrical circuits will have separate fuses suitably indicated & will be grouped into a common fuse box located in an accessible position in Driver's cab and fitted with means for carrying spare fuses. The wiring would be single pole and would not be exposed to the atmosphere. Conduits would be used wherever necessary.
2. All equipments lockers would have individual lights and these would be operated by means of a master switch on the dashboard in the driver's cabin.
3. Emergency light Bar with siren amplifier would be provided on the cabin rooftop in the middle in the best suitable manner.
4. The switch of the siren would be provided on the left corner of the dashboard (Near front left side)
5. Two fog lamps would be suitably attached to the front bumper of appliance.
6. Reversing lights on either side would be fixed suitably at the rear of the appliance with wire mesh in such a manner to prevent accidental damage by the fireman while mounting the tank top.
7. A spotlight of 50W power will be provided at the rear portion of appliance near the pump.
8. A powerful search light suitable halogen type & adjustable to give flood or beam light, capable of being readily disconnected & also mounted on a tripod away from the appliance would be provided with tripod & not less than 100 ft of best quality TRS cable with reel.
9. Acceptance test would satisfy the fulfillments of the requirements.
10. Suitable brackets would be provided on top of the water tank for stepney wheel.
11. The battery of the Vehicle would be properly secured with metal frame on top in an easily accessible position.

### 2.3.12 PAINTING

- (i) The complete external and internal aluminum paneling of cabin, tank and rear body shall be painted with two coats of Zinc Chromate paint.
- (ii) The complete exterior of the vehicle shall be painted with two finish coats of "Post Office Red" paint.
- (iii) The internal painting of cabin lockers etc. shall be done with two coats of Grey Synthetic enamel.
- (iv) The name of the department shall be painted on both sides of the vehicle along with the EMBLEM of the department in natural colors at suitable place.

### 2.3.13 ACCEPTANCE TESTS

The design of tender shall be such that it will not affect the Chassis Characteristic as specified by the chassis manufacturer such as speed, turning circle, acceleration etc. Also, pump test as prescribed below

#### 2.3.13.1 Pump Test

- Endurance test: Three hours at 8.5 bars and one hour at 35 kg/cm<sup>2</sup> with a lift of 3 m. without replenishing radiator water.
- Temperature: The engine should show no sign of stress during the test. The temperature of the cooling water (radiator water) tank shall not exceed 85°C.
- Pressure Test: The pump casing and impeller shall be subjected to hydraulic pressure of 21 kgf/cm<sup>2</sup> to detect leakage, perforation, etc.
- Stability: Not less than 25° from horizontal.
- Speed & acceleration, Brake test, Gradability, articulation, Priming Test, Throw & Discharge Test shall also form part of test of acceptance beside workmanship.
- Accessories shall also be subjected to performance test indicated for each as per specification.

List of mandatory and optional accessories with water bowser are recommended in **Table 2-4**.

**Table 2-4: List of Accessories Recommended for Water Bowser**

Sl. No	ITEM	PERFORMANCE CONFORMING TO	QTY. (in Numbers)	REMARKS
1.	Armored suction hose 125 mm diameter complete with round thread couplings 2.5 m long.	IS : 3549	4	
2	Suction strainer for above.	IS:907	1	
3.	Basket strainer for Item 2	IS : 3582	1	
4.	Suction wrenches	IS : 4643	2	Pair, Fixed type
5.	Non-percolating flexible firefighting delivery Hoses synthetic jacketed with elastomeric outer covering, 63 mm and 30m long with instantaneous couplings.	IS:636:88Type A	4	These are in addition to the 4 length connected to the branch pipe.
6.	Hose bandages, rubberized	IS:5612(Part-II)	12	
7.	Hose clamps	IS:5612(Part I)	6	

Sl. No	ITEM	PERFORMANCE CONFORMING TO	QTY. (in Numbers)	REMARKS
8.	Dual purpose jet diffuser nozzle with hand control & trigger with instantaneous coupling (63 mm.)	IS : 2871	2	
9.	Light Alloy branch Pipe	IS : 903	2	
10.	Nozzle for light alloy branch pipe sizes (a) 12 mm (b) 19 mm	IS : 903	1 1	
11.	Nozzle spanner	IS : 903	2	
12.	Dividing breechings made out of light alloy	IS : 5131	1	
13.	Foam making branch pipe ( jet & spray – FB – 10 X)		2	
14	Lightweight PORTABLE FIRE PUMP of 275 LPM at 4 kg/cm <sup>2</sup> capacity coupled to a suitable Single cylinder air-cooled Diesel engine with 75 mm suction inlet and 1 no. 63 mm diameter delivery outlet. The overall weight of the pump shall not be more than 75 kg The pump should be supplied with 3 nos .2.5 meters long PVC suction hose with couplings, 1 no. suction strainer, 1 no basket strainer and suction wrenches.	IS 942 / 82	1	

## 2.4 Foam Tender

Approximate Cost: Rs. 40 Lakhs.

The provision of foam fire tender has become compulsory for those fire stations, in whose jurisdiction small industrial area lies or which is located in the funnel area of an airport (additional foam tender required). POL Depots, Petrol Pumps, carriage of highly flammable substances and other fire hazards are very common features of any modern city. It was, therefore, felt necessary to draw a standard for the type of equipment, which can deal with fuel fire and can be positioned at city fire brigade stations.

The foam fire tender, including all accessories, should be designed & manufactured as per the following specifications and sound engineering practice. All the equipments & accessories should be fixed on the appliance in a compact & neat manner & will be so placed that each part is easily & readily accessible for use and maintenance.

### 2.4.1 CHASSIS

The chassis shall be suitable to carry minimum 16 tons G V W, 4x2. The engine fitted on the chassis shall comply with the respective emission norms in force at the time of delivery of chassis. The chassis shall be brand new with the following specifications.

- (i) Engine : 6 cylinder, in line, 4 stroke, water cooled, Turbo charged, inter cooled,  
diesel engine developing not less than 150 bhp and conforming to prevalent emission norms.
- (ii) Clutch : Single plate dry friction type hydraulically actuated.
- (iii) Gear : Synchromesh gearbox with 6 forward and 1 reverse gear.
- (iv) Front Axle : Heavy duty, forged, 'I' beam.
- (v) Rear Axle : Single reduction, hypoid gears, fully floating axle shaft
- (vi) Steering : Integral hydraulic power assisted steering
- (vii) Brakes parking : Dual circuit fully air braking system with pneumatically operated brakes on rear wheels.
- (viii) Suspension: Semi- elliptical leaf spring at front and rear with hydraulic double acting shock absorber on front.
- (ix) Frame : Ladder type heavy duty frame with riveted / bolted cross members.
- (x) Wheels and Tyres: Suitable size available in local market with minimum 16 PR – 7 Nos.  
(including spare wheel)
- (xi) Fuel Tank : Minimum 160 liters capacity.
- (xii) Electrical System: 12/24 volts. 120 Ah capacity battery with Alternator. C
- (xiii) Cowl : Standard cowl duly painted in RED color with instrument cluster, rear view mirrors, Wiper system, original driver seat, safety belts.
- (xiv) GVW : Not less than 16000 Kg
- (xv) Safety features : Anti Lock Breaking System (ABS)



### 2.4.2 PUMP

The pump shall be centrifugal type, multi pressure, having output capacity of 3000 LPM at 8 kg/cm<sup>2</sup> and 300 LPM at 35 kg/cm<sup>2</sup> at 3 meters suction lift at NTP condition. The low-pressure side will be of single stage and the high-pressure side also with single stage having regenerative type impeller.

The pump shall comply to the following performance parameters.

- a) Normal pressure output : about 2270 LPM at 7 kg/cm<sup>2</sup> about 2,000 LPM at 8.5 kg/cm<sup>2</sup>
- b) High pressure output : about 300 LPM at 40 kg/cm<sup>2</sup>
- c) Maximum pressure in : 14 kg/cm<sup>2</sup> (shut off pressure) normal pressure mode.
- d) Maximum pressure in : 45 kg/cm<sup>2</sup> High pressure mode
- e) Deep lifting capacity of pump : 30 cm/sec max. up to 7 meters in 30 sec at

NTP condition.

The overall pump shall be constructed from gunmetal. The normal (low) pressure impeller, volute, and impeller wearing shall be made from gunmetal conforming to Gr II of IS 318/1981 and the regenerative type high pressure impeller shall be of Aluminum, Bronze (AB-2). The pump shaft shall be made from stainless steel conforming to IS 6603/1972. The bearing housing will be made of C.I. and all the studs and bolts coming in contact with water shall be of stainless steel. The bearings used in the pump shall be of reputed make. The other specifications are -

- (i) The normal and high-pressure impeller shall be mounted on a single shaft and normal (low) pressure impeller shall be dynamically balanced.
- (ii) The pump shall be provided with self-adjusting mechanical carbon seal with interface plate. The mechanical seal assembly shall with stand dry running of pump up to 2 minutes without any damages.
- (iii) The pump shall be provided with an inbuilt filter of easily removable type, which shall filter the water before entering into the high-pressure stage impeller.
- (iv) Operation of low pressure to high pressure or vice-a-versa shall be possible by actuation of single lever.
- (v) The pump shall have facility to operate low pressure and high-pressure mode simultaneously or individually. While high-pressure mode is in operation and delivering about 300 LPM at 40 kg/cm<sup>2</sup>, the pressure in low-pressure side shall not exceed 8.5 kg/cm<sup>2</sup>.
- (vi) The pump shall be provided in built (integrated in the pump outlet manifold) Pressure Relief Valve (PRV) which shall operate automatically and shall not allow the high pressure to increase beyond 45 kg/cm<sup>2</sup>.
- (vii) The size of high-pressure outlet shall be of 25 mm connected to high-pressure hose reel.
- (viii) The Thermal Relief Valve (TRV) shall be provided and fitted in the pump housing, which will open when both deliveries (HP and LP) are shut off for longtime to control the temperature of pump water. The Thermal Relief Valve (TRV) should open at 60



deg Celsius and shall reset automatically when the temperature of water is within limit.

- (ix) The pump design shall be modular type and shall not have gaskets/packing. The arrangement shall be such that the carbon seal can be attended / removed without removing the pump body. The pump shall be provided deep groove heavy-duty dual angular contact bearing immersed in oil bath.
- (x) The pump shall be provided with one suction inlet of 125 mm dia. having round threads conforming to IS 902 of 1974 and three numbers of 63 mm delivery outlets having screw down type valves fitted with instantaneous couplings as per IS 903/1993. The delivery valve spindle sealing shall not be of gland type. The high-pressure outlet shall not be less than 25 mm and shall either be flange on screw type.
- (xi) The efficiency of the pump shall be such that the power and RPM required shall not be more than available with the engine.
- (xii) The pump housing shall have provision to connect to internal cooling system.
- (xiii) The pump shall be mounted at the rear of the vehicle connected to P.T.O. by propeller shafts and universal and slip joints with sufficient number of bearing supports.
- (xiv) Pump primer – The priming system shall be horizontal Reciprocating type integrated in pump bearing housing. The priming shall be fully automatic in operation and shall not require any operation whatever from the pump operator other than throttling the engine to the required RPM. The primer shall be automatically disengaged once the pump is registered the pressure. The primer shall be capable of lifting the water in 30 seconds from the depth of 7 meters. (up to pump inlet) at NTP condition. The pump shall attain a dry vacuum of 620 mm of Hg. The reciprocating pistons shall be made up of stainless steel and reciprocate in self-lubricated linear bearings. The cylinder and priming valve housing shall be made from gunmetal. The eccentric cam shall be fitted on pump main shaft to operate the pistons with neoprene rubber inlet and outlet valves. The primer shall disengage automatically at a pump pressure of 1.5 to 2.0 kg/cm<sup>2</sup>.
- (xv) In addition, Exhaust ejector type primer capable of lifting water from 7 meters within 30 seconds shall also be provided.

### 2.4.3 PUMP TEST

The pump fitted on the vehicle shall be subjected to various test as detailed below:

- (i) The pump with its all fitments will be subjected to Hydrostatic testing on a pressure of 21 kg/cm<sup>2</sup>.
- (ii) The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of mechanical carbon seal. After this test, there shall not be any leakage of water through carbon seal.
- (iii) The pump performance test will be carried out by running the pump at constant RPM at 2600 and measuring the discharge at various pressures.
- (iv) The pump will be subjected to Endurance test for a period of four hours continuous running. The first Three hours the pump shall deliver rated output of 3000 LPM at 8 kg/cm<sup>2</sup> and next one hour will be 300 LPM at 35 kg/cm<sup>2</sup>.
- (v) During the endurance test, the water shall not be replenished in the cooling system and the temperature of the cooling water, engine oil should not exceed the

manufacturers standards recommendations for the continuous operation, and engine should not show any sign of stresses.

(vi) Foam induction test to check the calibration of metering valve.

(vii) Foam production test with monitor and side lines for foam quality.

#### **2.4.4 POWER TAKE OFF**

The P.T.O shall be Heavy-duty type of suitable ratio capable of transmitting the full torque of the engine in first gear. The lever for engaging the P.T.O. shall be provided in the Driver's cabin with proper locking arrangement. The PTO shall be mounted on heavy duty cross members and support brackets between the longitudinal members of the chassis frame. Means shall be provided to check the oil level in the PTO and suitable drain plug shall be provided at the bottom. A cooling coil made of copper tubes shall be provided inside the PTO at the bottom to prevent the oil of the PTO from heating.

#### **2.4.5 WATER TANK**

The capacity shall not be less than 4,000 liters. The tank body and baffles shall be of minimum 3.15 mm thick S.S. plates conforming to IS 304. The sides of the tank shall have Die Pressed reinforced webs for better strength and rigidity. The design of the tank should be such that the complete width of the vehicle is utilized and the height of the tank is to be kept as low as possible for better stability.

- A tank of required capacity constructed out of mild steel treated for anti-corrosion shall be suitably mounted on the chassis in a manner keeping in view the proper load distribution on the axles.
- A full length runner from behind the driver cabin till end of chassis frame shall be provided and made out of S.S. Channel of 100 x 50 x 3.15 mm suitably fixed to the chassis, frame with about 3.15 mm thick S.S. plate and bolted to chassis frame wherever holes are available in the chassis frame and also with 5/8" 'U' bolts and nuts shall be nylock nuts only.
- The tank shall be suitably baffled with minimum 2 nos of baffles fitted longitudinally and 2 nos baffles fitted transversely to prevent surge when the vehicle is breaking, cornering or accelerating.
- The baffles shall be arranged in a manner to facilitate the passage of a man throughout the tank for cleaning purpose.
- The tank shall be mounted on minimum three cross members to counter act the stresses caused by chassis flexion and shall be so secured that it can be easily removed. The water tank shall be provided with six chairs, three on either side for mounting the tank on the runner and chassis frame.
- The water tank shall be fixed to the chassis frame and runner with 'U' clamps and aluminum packing block and self-locking nuts.
- Suitable eyes shall be provided on the shell of the tank to enable it to be lifted from the vehicle for repairs / replacement as and when required
- The tank shall be fitted with a 50 mm bore overflow pipe. Two 63 mm instantaneous hydrant connection, incorporating a strainer with NRV, shall be provided close to the pump control panel for filling the tank through 75 mm bore pipe. Minimum 125 mm bore pipeline shall be taken from the tank to the suction inlet of the pump incorporating minimum 125 mm internal diameter butterfly type valve. Drain valve shall be provided at the bottom of the tank.

- The MS plates used for the tank shall be Zinc Plated or galvanized and shall be given adequate anti-corrosive treatment of epoxy treatment consisting of one coat of primer with two coats of finish after preparing the surface by sand or shot blasting from inside and outside after fabrication if it is not galvanized. The open end of the overflow pipe should be taken down to a point well below the chassis without affecting the effective ground clearance when fully loaded and shall discharge away from the wheels.
- Visual level gauge of the glass / acrylic tube shall be provided at the control panel calibrated 1/4, 1/2, 3/4 and full (preferably calibrated in liters).
- The tank shall have a bolted manhole of 60 cm diameter minimum and should have a gunmetal threaded ring and gun metal cap of 30 cm diameter for filling the water tank from the top. The manhole cover shall be made from about 3.15 mm thick S.S. plate and epoxy coated from inside and outside. A cleaning hole of at least 25 cm diameter shall also be provided at the bottom.
- The tank shall be connected with the pump and hose reel and valve(s) shall be provided in such a way that any of the following operations are possible:
  - e) Hydrant - tank,
  - f) Hydrant - reel,
  - g) Tank – pump - high and low pressure hose reels,
  - h) Hydrant – pump - low pressure hose reel, and
  - e) Tank - Pump - Monitor (Foam/Water)
  - f) Off.

#### 2.4.6 FOAM TANK

The foam tank of 500 Liters capacity will be fabricated out of min. 3.15 mm thick SS plates (IS 304) for bottom & the sides & baffles. The tank will be suitably baffled. In addition, a 2% of expansion space will be made in the tank, over and above foam compound capacity.

- The cleaning hole of 250mm & drainpipe with a ball valve & plug incorporated in it will be provided. The filler orifice of 150mm dia. with a removable strainer (Material-Resistant to the attack of foam compound) will be provided. The filler cap will be clearly marked "FOAM".
- The design of the tank shall incorporate a removable sump fitted with a drain valve. The foam compound draw off tube shall be positioned in the centre of the sump in such a manner that foreign matter or sludge will not pass into the compound line. The draw off tube shall be fitted with a gauge strainer of suitable material, mesh, size & adequate straining area.
- Means shall be provided for automatic venting of the foam tank when the foam is being produced or the tank is being filled. The device employed shall be as simple as possible & shall not get clogged easily during normal use of the Appliance.
- Inspection hole of 450 mm with cover will be provided. Means will be provided for automatic venting of the foam compound tank when the foam compound is drawn from it or when the tank is being filled.
- A foam solution transfer pump Rotary type with necessary piping will be provided. Provision will be made for drawing foam compound direct from an external source through a pick up tube while producing foam.

- The draw off tube will be connected to the foam proportioner with NRV in addition to the main control valve. The draw off pipe will be fitted with removable strainer.
- Visual level gauge of the glass / acrylic tube shall be provided at the control panel calibrated 1/4, 1/2, 3/4 and full (preferably calibrated in liters).

#### **2.4.7 FOAM PROPORTIONER**

Manually operated selector type around the pump foam proportioning system shall be provided at the rear of the pump. The Pump proportioner shall induct foam & water proportionately to feed the foam monitor and hand lines at rate of 6 % plus/minus 0.5% foam. The proportioner shall be calibrated to ensure the correct intake of air foam liquid to foam equipment. This shall have five different position selector valve i.e. 0, 1, 2, 3 & 4.

#### **2.4.8 DELIVERY OUTLETS**

There will be 3 Nos. delivery outlets having standard GM inst. female coupling with screw down type delivery valves with blank caps. It will have twist type lugs made of gunmetal.

#### **2.4.9 HIGH PRESSURE HOSE REEL**

Two high-pressure hose reel to facilitate operation of the high-pressure section of the Fire Pump will be provided and mounted so as to be accessible for use from either side of the appliance. The hose should be prevented from kinking. The hose shall be lightweight PVC nylon braided hose or equivalent and the working pressure of hose will not be less than 40 kg/cm<sup>2</sup>.

The high-pressure Hose reels will hold not less than 30 M of hose in one length, terminating in High-pressure fog/jet trigger type gun connected by quick connect couplings. The fog gun shall be made of Aluminium alloy or stainless steel (SS, IS304).

The inlet connection shall have a leak proof rotating type hose connector. The gun shall be of constant flow type and shall have a discharge capacity of 150 LPM approximately. Provision shall be made in the gun controls to achieve combat mode (straight jet) or a fog shield in split second. The gun shall have the ability to work on pressure for 20 kg/cm<sup>2</sup> to 40 kg/cm<sup>2</sup> without affecting discharge pattern. The weight of the gun assembly shall not be more than 3 kg.

#### **2.4.10 WATER/ FOAM MONITOR**

One water cum foam monitor will be provided on the top at suitable location, with capacity of 3,000 LPM of water @8.5 kg/cm<sup>2</sup>. The monitor will be capable of traversing through 360° in horizontal plane, +75° & -15° in vertical plane with discharge range of 70 M (water). The detailed specification of the Monitor is as under:

- Size- 100 mm
- Body- Barrel of SS, GM swivel joint for horizontal & vertical motion manual operation
- Rotation- 360°
- Elevation- 90° (+75° -15°)

##### **2.4.10.1 Construction Details**

- Working pressure 7 to 10 kg/cm<sup>2</sup>.
- Painting As per IS:5 (2 coats of red enamel paint)

#### 2.4.10.2 Self Induction Nozzle

- Material of construction Aluminium alloy to IS:617 or GM LTB Gr.2 of IS:318.
- Type of Foam used AFF Foam
- Discharge capacity 3000 LPM
- Throw horizontal Water: min. 70 mtrs. , Foam: min. 65 mtrs.
- Foam Expansion Min. 1:6
- Fog (curtain) 160°
- K Factor 100

Semi fog for tank cooling, dissipation of vapor & gases at a distance of 10m & above.

#### 2.4.11 PIPELINES AND VALVES

All pipelines and pipe fittings shall be of Stainless steel (SS 304) and all valves up to 50mm size shall be 3 piece design SS 304 ball valves. All valves above 50mm size shall be standard butterfly valves.

All piping shall be sized to have minimum pressure drop and achieve the required pressure and flow at various locations.

All piping shall be designed for 10% over the maximum pressures encountered in the pipe.

The piping shall be flanged for ease of maintenance. However, flange joints shall be kept to minimum.

All lines shall be hydraulically tested at 1.5 times of the design pressure and pressure shall be held for two hours. In no case, the lines shall be tested below 25 kg/sq. cm. (g).

All lines shall be suitably supported to provide rigidity and avoid vibrations.

All lines less than 50 mm NB size can be socket welded to matching rating fittings.

All lines above 50mm NB size shall be butts welded with full penetration welds.

All bolts, nuts and washers used shall be of SS-304.

##### 2.4.11.1 Cooling System

An indirect cooling system of open circuit type heat exchanger shall be provided for cooling the radiator water & Engine. The heat exchanger tank shall be made from minimum 1.22 mm thick brass sheets and the coil in the coolant tank shall be of copper for effective cooling. The design of the heat exchanger shall be such that the temperature of the engine shall not exceed the operating temperature specified by the chassis manufacturer when the vehicle is being used in stationary conditions.

#### 2.4.12 CONTROL PANEL

- Adequately illuminated control panel shall be provided near the pump.
- The control panel(s) shall include the following:
  - a) Throttle control for engine;
  - b) Pressure gauge — 0 to 17.5 kg/cm<sup>2</sup>; for low pressure (glycerin filled)
  - c) Pressure gauge — 0 to 50 kg/cm<sup>2</sup>; for high pressure (glycerin filled)
  - d) Compound gauge (glycerin filled) calibrated as under:
  - e) Vacuum — 0 to 75 cm Hg, preferably in black;
  - f) Pressure — 0 to 15 kg/cm<sup>2</sup>, preferably in black;

- g) Primer control for exhaust primer
- h) Temperature gauge and glow lamp for lubricating system
- i) Cooling water circuit control.
- j) Water tank valve
- k) Foam tank valve
- l) Foam proportioning valve.
- m) Auxiliary foam connection with valve.
- n) Monitor valve
- o) Delivery valves.
- p) Suction inlet.
- q) Hose reel valves.
- r) Water level indicator
- s) Foam level indicator

#### **2.4.13 BODY WORK AND STOWAGE**

Enclosed accommodation for six persons shall be provided in the driver cab-cum-crew compartment including the driver and the in-charge of the crew. Both the seats should be independent. The driver's seat should be adjustable and comfortable. The rear compartment of driver's cabin should have one removable seat for full width of cab for 5 (five) crew members. The cab floor should be covered with 3 mm thick Aluminium chequered plate rigidly fixed to the under frame cross members by means of nuts and bolts or riveting except the mudguard arches which shall be covered with 1,60 mm Aluminium chequered plates. Trap doors for topping up oil etc wherever necessary shall be provided.

One roof light should be provided in the driver's cabin dwell vision and external rear view mirrors should be fitted to the cab.

The driver cum crew cabin shall be provided with full four doors, one for driver, and one for officer and two at the crew compartment. The doors shall be generously sized for easy embarking / disembarking of crewmembers. All the doors shall be fitted on the super structural members, each hung upon three invisible coach type M.S. stout hinges and fitted with best quality handles.

The door handle on outside of driver seat shall have a locking arrangement. Other doors shall be lockable from inside. In addition to the doors locks, aluminum tower bolt shall be provided for all the doors from inside Adequate grab rails shall be provided for easily boarding and alighting from the appliance.

The windscreen glass shall be provided in the two halves and shall be semi-curved type. Each glass shall be fitted in E.P.D.M. rubber beading. The glasses shall be 5 mm thick toughened safety glass.

The rubber beading used for fitting glasses and window frame shall be E.P.D.M. rubber.

The driver seat shall be adjustable type vertically, forward and backward. The officer seat shall be fixed type. Both the seats shall be rigidly fixed to the flooring by means of nuts and bolts.

The seat cushion shall be of latex foam rubber 75 mm thick upholstered in good quality foam leather cloth. The back seat shall be of latex foam rubber 50 mm thick upholstered in good quality foam leather cloth.

Below the crew seat, two lockers shall be provided one for battery box and another for keeping accessories. The extra length of battery cable if required shall be provided



The crew seat shall be rigidly fixed to floor by means of nuts and bolts, running full width of the vehicle suitable for sitting five firemen, covered with 75 mm x 50 mm cushion latex foam rubber upholstered in good quality foam leather of approved shade. The rear body shall be fabricated in continuation and in line. The under frame cross members shall be fabricated from the rolled M.S. channel of 100 x 50 x 5 mm size.

The M.S. runner of 100 x 50 x 5 mm size shall be provided over the full length of the chassis member for the uniform distribution of load over the chassis.

Each cross members shall be secured to the chassis frame by 16 mm diameter 'U' Bolts with aluminum packing block and self-locking unit.

Balata packing of thickness 6 mm shall be provided in between the chassis frame and across members.

The structure/frame work shall be of welded constructions and made from 2mm thick MS pressed sections and square tubes. The Angles and channels used shall be of min. 3mm thickness. The complete structure material shall be treated for anti corrosion by Zinc Plating. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The structure shall be so designed to avoid any vibration / ratting / deformation in the intended usage of the vehicle.

#### **2.4.13.1 The Details of Super Structure are as follows**

- |                                 |   |                        |
|---------------------------------|---|------------------------|
| (i) Under frame cross members   | : | 100 x 50 x 5 mm (Min.) |
| (ii) Floor longitudinal members | : | 50 x 50x 6 mm(Min.)    |

The cab and lockers should be of composite construction with sufficient rigidity and reinforcement and shall be kept as light as possible.

The interior paneling shall be done from 1.22mm thick aluminium sheets & the exterior paneling shall be done from 1.60mm thick aluminium sheets.

The roof on the cabin of the vehicle shall be covered with min 1.60mm thick aluminium chequered plates. All the lockers sides & complete rear of the vehicle shall be covered with min. 1.22mm thick aluminium chequered plates. The complete rear deck, all lockers floors, and the rear footboards shall be covered with minimum 3 mm thick aluminium chequered plate.

Sufficient number of Lockers with suitable shelves, partitions and roll in roll out type drawers / trays shall be provided on both sides of the vehicle for secure stowage of all equipment given in annexure. One through and through locker shall be provided immediately behind the drivers cab. All space available below the chassis frame level shall be utilized by providing lockers with proper doors. These doors shall be fitted with suitable chains and hooks on both sides so that the same can be used as footboard.

All lockers shall be provided with internal automatic lighting arrangement with the master switch in the cab.

All lockers above chassis floor shall be covered with Aluminium roller shutters. The roller shutters shall be made from extruded aluminium sections with suitable roller, spring, guide channels etc. All aluminium sections used shall be properly anodized.

The Roller shutters shall be rolled inwards underneath the roof giving unobstructed access to the equipment lockers and the firefighting material.

These roller shutters should open in every position of the vehicle even in rough terrain. Guide rails shall support the shutters over entire length on both sides to make them

absolutely torsion free. The roller shutters should have a sturdy lock, preventing accidental opening during movement of vehicle.

Roller shutters shall be made of hollow rectangular shaped aluminium links which shall be inter connected with rubber /plastic/ PVC profiles sealing the roller shutter watertight when closed. These roller shutters should be durable, maintenance free, weather and corrosion resistant.

Suitable storage space shall be provided to store four 2.5-m lengths of suction hoses with couplings at convenient location

#### **2.4.13.2 Special Provision for Stowage of Equipment**

For all hose, fittings like branch pipes etc., quick release type couplings are provided which enables the operator to locate the desired equipment instantly and thereby save valuable time at the time of fire. These couplings also ensure that none of the items damage the internal paneling & thereby increase the life of the vehicle. Suitable clamps, brackets, holders etc. are provided for all other items

#### **2.4.14 MISCELLANEOUS**

A suitable bumper shall be provided at the rear rigidly fixed to the super structural members by means of nuts and bolts which is supplied along with the chassis

Two cat ladders made out of S.S. round or square pipe of 25mm diameter shall be provided. 2 nos of 25mm diameter aluminum pipe railing with sufficient number of aluminum double socket brackets shall be provided to the rear body over the deck.

A heavy-duty Towing hook shall be provided and fitted the rear bumper by means of nuts and bolts.

Quick removable type wire mesh guard made from 25x25mm size MS wire mesh of 1.60 mm covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin.

##### **2.4.14.1 Cable Winch**

An electrically operated cable winch of not less than 6.5 tons pulling capacity (single layer) shall be provided. The winch unit should be complete with minimum 5.5 hp, 12v or 24v DC series wound electric reversible motor for pulling operations. The motor and solenoids shall be grounded to the battery. It shall have an automatic load holding brake system for holding the load. For free spooling, the clutch design shall be easy to use type with spring-loaded pull and rotate system. The gear system should be 3 stage planetary type for faster line speed and the gear reduction ratio shall not be more than 300:1 for maximum duty cycle, the rope drum shall not be of more than 8 inches diameter and shall be supplied with minimum 90 ft heavy duty galvanized wire rope with replaceable self locking clevis hook and shall be mounted on the front bumper of the vehicle with suitable strong supports and a 4 way roller fairlead. Weather resistant clutch housing and solenoid assembly for maximum durability under any weather should be provided. Winch shall be provided with a wireless remote control mechanism for ease of operation.

##### **2.4.14.2 Telescopic Light Masts**

A Pneumatic telescopic mast should be mounted on the vehicle. It should be manufactured from Anodized aluminium 6063 T6 alloy tubes, have a max diameter of 115 mm diameter on its base, and complete with a footplate Ø 150 with up to six fixing holes for bolts. The temperature range shall be from -40 deg. C up to 60 deg.C, with anti-twist lock, with safety valve and drainage outlet valve.

The telescopic mast should be extremely strong and designed with a minimum of 6 sections and it will be equipped with a special plastic locking system placed on the ring between the



first and the second section meant to eliminate any backlash between all the sections, once the mast is retracted. The mast will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>. For a better movement of the internal cable, the last three internal pistons will be threaded to the corresponding sections. The maximum height of the mast when deployed should be minimum 6000 mm (from the ground), the retracted height should be of maximum 1.900 mm: heights both are meant with the integrated tilt & turn unit. The working pressure cannot be less than 2.5 bar and more than 3.5 bar.

An electro-pneumatic group of valves must be supplied and mounted at the bottom of the mast with the possibility to regulate the extension speed and the retraction speed separately.

The Light mast will have 4 x 1000 Watt Halogen flood light projectors in weatherproof casing. The floodlights on the top should have a minimum electrical rotation of 365° and a tilt of 310°, by means of a tilt and turn unit with an ABS cover for inspection. An electronic PCB (printed circuit board) will be placed inside the tilt & turn unit, controlling all the functions of the mast, like pneumatic up/down, lights on/off, turning, tilting, emergency stop and automatic restore; still inside the tilt & turn unit, but separated from the PCB will be placed the relays for the lighting and switching off of the lights. The lights will be switched on and off in groups of 2+2. Suitable connections for taking permanent Power Supply from generator set through an internal spiral wire mounted inside the mast should be provided.

All the functions of the mast, including extension and return to the original position, lights on/off, automatic restore should be capable of being done through a wired remote control. The same remote control must work without wire (wireless mode) through a male/female connector IP68 which keeps the battery under charge, whenever the remote is plugged and there is tension on the electrical circuit. Every single input given by the user, no matter which, will be confirmed by a visual led and an additional led will confirm the battery status; every single group of 2 lights when switched on will have a corresponding led light on the remote control that will go off only when the lights will be switched off. Every single input given by the user on the remote control will make the whole remote keyboard alight for not less than 15 seconds.

A 5 KVA portable Petrol engine operated GENSET shall be installed at a suitable location in the rear locker and necessary wiring /connections shall be given to the light mast.

#### **2.4.15 ELECTRICAL SYSTEM**

All the important electrical circuit shall have separated fuses suitably indicated and shall be grouped into a common fuse box located at an accessible position. The wiring shall be single pole with negative earth.

- The suitable size wire shall be selected for different circuits considering the current consumption for that circuit.
- Electrical siren of 1.6Kms range 12/24 volts D.C. shall be provided and fitted at suitable place with two controlling push buttons on one officer side and another at Driver side.
- Two rotating beacon lights with Amber lens shall be provided over the top of driver's cabin.
- The other lights pump cabin light, locker lights shall be of approved make.
- All the controlling switches of lights on dashboard shall be approved make.
- Two fog lamps of approved make shall be provided and fitted on front-bumper with controlling switch on dashboard.

- New wiper motor assembly of 17 watts with new blades and arms shall be provided if not provided with the chassis. The location of wiper motor shall be such that it shall be easily accessible for repairs.
- Adjustable search light assembly shall be provided at a convenient position on the top of rear body deck with 30 meters Cable drum with Rexene cover.
- Hooter cum P.A. system shall be provided with a speaker mounted on the top of Driver's cabin with Rexene cover. The output shall be 25 watts.
- Adjustable spotlight, mounted in a convenient position to give flood or beam of light at the rear of driver cabin shall be provided.

#### **2.4.16 PAINTING**

The complete structure material shall be treated for anti corrosion by Zinc Plating. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure. The complete external and internal aluminum paneling of driver cum crew cabin and rear body shall be painted with two coats of Zinc Chromate paint.

The complete exterior of the vehicle shall be painted with two finish coats of "POST OFFICE RED" polyurethane paint manufactured by ICI Dulux / Nerolac / Dupont or similar brands. The internal painting of cabin lockers etc. shall be done with two coats of Grey Synthetic enamel paint made by ICI Dulux / Nerolac / Dupont or similar brands. The name of the fire service/organization shall be painted on both sides of vehicle in letter of suitable size in golden yellow paint with black color shading.

The "EMBLEM" of the department shall be painted on both sides of vehicle in natural colors at suitable place.

#### **2.4.17 LADDER WITH GALLOWS**

An aluminium extension ladder of trussed type 10.5 meters height shall be provided with the vehicle and mounted on suitable ladder gallows.

The design of the gallows shall be such that the ladder can be released without difficulty from a reasonably accessible position. Means shall be provided for looking the ladder when stowed.

#### **2.4.18 B.A. SET BRACKETS**

B.A. set brackets for fixing with its fitments shall be provided just behind the crew seat. The mounting of B.A. set bracket shall be such that, it can allow fireman to wear B.A. set while vehicle is approaching to fire call. Proper padding and harnessing arrangement shall be made in the bracket to avoid damages to the critical parts of the BA set.

#### **2.4.19 ACCESSORIES**

The following accessories shall be provided.

- Fire Bell: (Bell Carillon): One Gun metal fire bells of 250 mm size conforming to IS 1928 of 1984 shall be mounted externally on the top of crew compartment and shall be operated within the crew compartment by firemen in seating position.
- Six aluminum hooks for keeping the uniform clothing shall be provided in crew compartment.

#### 2.4.20 WIRELESS SET BOX

Box made from 2 mm gauge aluminum sheet with lid shall be provided just behind the officer seat with 13mm wooden plank for fitting the wireless set bracket. The design and mounting will be shown at the time of fabrication work.

#### 2.4.21 WORKMANSHIP AND FINISH

The GVW of appliance will not cross the GVW of chassis manufacturer. Specification with all equipments & Crew. The weight distribution diagram should be submitted for approval. The entire appliance will be painted fire red on the outside. The user name will be written on both-side with yellow color. Before final painting of Fire Tender, two coats of anti corrosion and primer coat will be applied.

- The appliance will clearly have the following markings at suitable locations.
- Manufacturers name and Trade mark.
- Engine and Chassis No.
- Pump No. and capacity of the pump.
- Capacity of Water tank, Foam tank
- All instruments control will be identified with nameplates

#### 2.4.22 ACCEPTANCE TESTS

The following acceptance test will be given to the complete satisfaction of the user. The design of vehicle will be such that it will not affect the Chassis Characteristic as specified by the chassis manufacturer such as speed, turning circle, acceleration, braking distance etc.

- (i) The stability of the appliance will be such that when under fully equipped & laden condition, if the surface on which the appliance stands is tilted to either side, the point at which over turning occurs is not passed at an angle of  $27^{\circ}$  from horizontal. This test should be carried out at the vendor factory in front of all the inspecting officers.
- (ii) The pump with its all fitments will be subjected to Hydrostatic testing on a pressure of  $21 \text{ kg/cm}^2$
- (iii) The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of mechanical carbon seal. After this test there shall not be any leakage of water through carbon seal.
- (iv) The pump will be subjected to Endurance test for a period of FOUR hours continuous running. The first Three hours the pump shall deliver rated output of 3000 LPM at  $8 \text{ kg/cm}^2$  and next one hour will be 300 LPM at  $35 \text{ kg/cm}^2$ .
- (v) During the endurance test the water shall not be replenished in the cooling system and the temperature of the cooling water, engine oil should not exceed the manufacturers standards recommendations for the continuous operation, and engine should not show any sign of stresses.
- (vi) The other tests shall be as per detailed performance parameters given for chassis, superstructure, and firefighting system, which include monitor output & throw, foam induction & expansion, load etc.
- (vii) Accessories shall also be subjected to relevant tests as per the specification indicated above.

List of mandatory and optional accessories with Foam Tender are recommended in **Table 2-5**.

**Table 2-5: List of Accessories Recommended for Foam Tender**

Sl. No.	ITEM	QUANTITY
1.	125 mm rubber suction hose in 2.5 meters length with 125 mm suction hose GM couplings as per IS: 3549-1983	4 NOS
2.	Suction collecting head – 125mm suction inlet, GM 2 way as per IS: 904: 1983	1 no
3.	Suction strainer for 125mm suction hose – brass as per IS: 907: 1984	1 no
4.	Dividing breaching with control 63mm instantaneous pattern – GM as per IS: 5131: 2002	1 no
5.	Collecting breaching 63mm instantaneous pattern – GM as per IS: 905: 1980	1 no
6.	Suction wrenches for 125mm suction hose couplings as per IS: 4643: 1984	2 nos
7.	Combine key for hydrant cover and lower valve as per IS: 910: 1980	2 nos
8.	Hose straps as per IS: 5612: 1977 part I	6 nos
9.	Branch with revolving head, GM, 63mm size as per IS: 906: 1988	1 no
10.	Torch electric with 4 cell water proof	2 nos
11.	Flame proof torch (approved by CCOE)	2 nos
12.	Foam branch – FB5X type with pick up tube, GM as per IS: 2097: 1983	2 no
13.	Rope polyamide 32mm dia for lowering line of 30mtr long with sealed ends	1 no
14.	Rope polyamide 12mm dia for guy line of 30 mtr long with sealed ends	1 no
15.	Rope polyamide 24mm dia for long line of 30 mtr long with sealed ends	1 no
16.	Rope polyamide 22mm dia for short line of 20 mtr long with sealed ends	1 no
17.	Hose bandages as per IS: 5612: 1977 part 2	4 nos
18.	Hose slings as per IS	2 nos
19.	Rubber gloves as per IS 4770-1991 for 5000Volts	4 pairs
20.	Leather gloves IS 6994 – 1977 PART 1	2 pairs
21.	Canvas gloves with anti skid palm	2 pairs
22.	Axe large as per IS: 963: 1963	2 nos
23.	Pick axe as per IS: 703: 1968	1 no

Sl. No.	ITEM	QUANTITY
24.	Firemen Axe as per IS: 926	1 no
25.	Spade with wooden handle	1 no
26.	Crow bar of 6 ft long 25mm dia as per IS: 704: 1968	2 nos
27.	Spanner adjustable, 30cm long	1 no
28.	Jack Hydraulic for 20 ton capacity with handle	1 no
29.	Oil feeder standard capacity	1 no
30.	Funnel 300mm dia made from GI 18SWG sheet	1 no
31.	Hammer sledge with wooden handle – 10 kg	1 no
32.	Hammer sledge with wooden handle – 5 kg	1 no
33.	Suction adaptor GM 125mm female x 63mm male with lugs	1 no
34.	Adaptor 63mm male to 38mm female GM	2 nos
35.	Adaptor 63mm female to 63mm female GM	1 no
36.	Tool kit (fixed spanners, ring spanners, screw drivers & Plier insulated)	1 no
37.	Belt hook	1 no
38.	Selectable flow nozzle, made of aluminium alloy (hard anodized), light weight and easy handling having 63 mm size male instantaneous inlet. Nozzle shall have rubber moulded bumper and pistol grip handle, ball valve with shut off handle. Selectable flow capacity, nozzle flow rate settings of approx. 200-250-350-475-600 lpm at 7 kg/cm <sup>2</sup> , with good range hollow jet, and dense fog in spray position and having a arrangement of low and medium expansion foam attachment.	3 no
39.	Branch pipe with 19 mm nozzle GM 63mm male inlet as per IS: 903: 1993	1 no
40.	Sand bag canvas, round shape, 300 mm dia, 450mm length with cotton rope for closing mouth	2 nos
41.	Cap hydrant spindle	1 no
42.	Cap hydrant spindle new pattern	1 no
43.	Chisel cold	2 nos
44.	Tyre Lever	
45.	Bolt cutter – 600mm long –	1 no

Sl. No.	ITEM	QUANTITY
46.	Hammer ball pein – 500 gms	1 no
47.	Hook ceiling (preventor) with 3mtr.long wooden handle	1 no
48.	Hook anchor	1 no
49.	Knife salvage	1 no
50.	Tyre lever	
51.	Plier cutting	1 no
52.	Plier insulated	1 no
53.	Petrol Chain saw machine, 600 mm guide bar length, with spare chain.	1 no
54.	Rake three prong	1 no
55.	Hose ramp (rubber) as per IS standard 30 ton capacity suitable for 2 lines	4 nos
56.	Saw carpenter – 300mm	1 no
57.	Door Breaker manual	1 no
58.	Shovel with handle	1 no
59.	Nozzle spanner as per IS standard	1 no
60.	Strainer wicker with canvas hood	1 no
61.	Portable ground monitor 1800 LPM at 8.5 kg/cm <sup>2</sup>	1 no
62.	Hand held forcible entry tool – Paratech PRT kit	1 no
63.	Delivery hose 63 mm diameter conforming to IS 636-1988 Type A in 30 m. length with Gun Metal male and female couplings. The hose and the couplings should be ISI marked.	10 nos.

## 2.5 Dry Chemical Powder (DCP) Tender

Approximate Cost: Rs. 35 Lakhs.

The Dry Chemical Powder is recommended for use on class 'B' fires. There are varieties of powders available in the market; performance of each varies on different type of fires. In this standard, ISO 7202 has been recommended, which is most suitable for class 'A' & 'B' fires. Chemical powder for metal fires may be selected in accordance with the requirements. Use of Dry Chemical Powder is also recommended in sub-zero climate, where use of water is restricted.

This standard has been prepared for Dry Chemical Powder Tender and gives detailed design and performance criteria. The parameters are minimum and therefore the purchaser may suitably incorporate requirement in access of performance given in this standard. A brief description about the specification of DCP Tender is given below:

- The DCP tender shall be fabricated generally conforming to IS10993/84 on any indigenous Chassis.
- The total weight of the DCP Tender shall not exceed the GVW Specified by the chassis manufacturer.
- The DCP Tender shall be of 2000 kg capacity. 2 numbers. DCP vessels of 1000 kg capacity each will be provided. The DCP Vessels would be mounted on the chassis in such a manner that the weight is evenly distributed on the chassis.
- The DCP pressure vessels shall be designed & fabricated as per ASME CODE VIII of unfired pressure vessels & suitable anti corrosion treatment would be given to the internal surface of the vessels with lead tin alloy lining.
- Each DCP vessel shall be equipped with filling aperture, pressure gauge, pressure release safety valve, discharge plug etc. at suitable locations.
- Each DCP vessel shall be designed for the use of Dry Chemical Powder conforming to ISO7202. The vessel would be of adequate size to accommodate 1000 kg of Dry Powder & also have adequate empty area to facilitate easy movement of the N<sub>2</sub> gas & dry powder in the vessel to maintain fluidity.
- N<sub>2</sub> gas shall be used as the expellant media. Each DCP vessel will have its own expellant gas cylinder assembly consisting of min. 4 Nos. N<sub>2</sub> cylinders of 50 Liters. capacity each to discharge dry powder through a long range monitor & two hand lines (hose reels) or both at one time. The total qty. of gas would be sufficient to discharge 2000 kg of dry powder & for flushing the pipeline etc.
- The discharge valves of the N<sub>2</sub> cylinders shall be wheel type only. The operating pressure of the dry powder vessel will not be more than 14 kg/cm<sup>2</sup>.
- The N<sub>2</sub> cylinders will be positioned properly behind the driver cab with proper stand & supports so that minimum 95% gas is utilized in discharging of DCP. The entire pipelines between the N<sub>2</sub> cylinders & the DCP vessel would be of rigid type only. A pressure regulator would be provided between the N<sub>2</sub> cylinders & the DCP vessel to regulate the flow of gas to the DCP vessel at not more than 14 kg/cm<sup>2</sup> pressure. Arrangement will be made to prevent back flow of the expellant gas.



- Each battery of N<sub>2</sub> cylinders shall be connected to a common manifold made of seamless steel tubes with necessary valve regulators etc.
- A suitable connection shall be provided to fill up all the empty N<sub>2</sub> cylinders directly without having to remove the N<sub>2</sub> cylinders from the vehicle.
- Each vessel shall be provided with a blow valve or similar device to discharge excess N<sub>2</sub> gas in the atmosphere even if the vessel is full with DCP. The excess gas would not affect the DCP.
- The DCP vessels shall be so designed that the total discharge from each vessel is not less than 95% of its total capacity. Sufficient quantity of gas would also be available to flush the entire pipelines; hand-lines monitor lines etc. after use.
- An alternate independent connection from the expellant gas manifold will be provided to flush all the lines after use & the control valve for flushing the hand lines etc. will be located on the control panel.
- A long range DCP Monitor will be mounted on an independent platform immediately behind the driver's cabin. The monitor would be capable of traversing 360° in horizontal plane. A suitable locking device would be provided to lock the monitor at the desired position while in use.
- The monitor shall be capable of throwing the dry powder to a distance of not less than 40 M in still air. The discharge through the monitor shall be adjustable at 15, 25 & 40 kg/sec. at operating pressure. The throw of the monitor would be manually regulated. The monitor shall be connected to both the DCP containers to enable powder to be discharged from both vessels.
- Two hand lines connected to the rear DCP vessel will be provided with 30 meters long high-pressure hose fitted with trigger type nozzle & shall be mounted on a hose reel of sufficient size. The hose reels shall be located at the rear of the appliance in an easily accessible position to facilitate quick withdrawal. The hose reel shall be designed in such a manner that overrunning of the hose is prevented at all times and prevents kinking of the hose while winding. The discharge of the dry powder from each hand-line shall not be less than 3 kg/sec and the throw not less than 10 meters at full operating pressure.
- The control panel with all necessary control valves gauges etc. will be provided on the OFF SIDE of the vehicle. The complete control panel will be covered with aluminum-chequered plates of 18 swg thickness.
- Enclosed accommodation will be provided for driver & one officer in a single compartment driver's cabin. The windshield glasses would be curved type only.
- The rear structure would be made out of 40mm x 40mm sq. tubes of 3mm thickness. The structure of the cabin would be from 14g MS pressed sections duly treated for anti corrosion.
- The complete outside paneling would be done from not less than 16g aluminium sheets & internal paneling shall be from 18g aluminium chequered plates. The paneling on the cabin roof shall be from 18g aluminium sheets.



- The entire flooring of the vehicle would be covered with 10g aluminium chequered plates. The roof of the rear body would be covered with 16g aluminium chequered plates.
- Three Nos. Lockers i.e. one at the rear & one on each side of the vehicle shall be provided to carry necessary equipments. The complete internal and external paneling of the lockers would be from 16/18g aluminum chequered plates only.
- The DCP Tender shall be supplied complete with initial charge of 2000 kg Dry chemical powder & filled N2 cylinders.

The following accessories will be provided:

- |  |   |        |
|--|---|--------|
| (i) Electrically operated Siren                              | : | 1 No.  |
| (ii) Two Tone Hooter with Public Address System              | : | 1 No.  |
| (iii) Red Revolving Lights                                   | : | 2 Nos. |
| (iv) Search Light with 30 meters. Wire Reel and Tripod Stand | : | 1 No.  |

The following additional equipments would also be supplied along-with the vehicle.

- |   |   |         |
|---|---|---------|
| (i) Fireman's Axe                             | : | 2 Nos.  |
| (ii) Axe Large                                | : | 1 No.   |
| (iii) Hand held Forcible entry tool (PRT kit) | : | 1 no    |
| (iv) Shovel                                   | : | 1 No.   |
| (v) Dry Chemical Powder (spare)               | : | 2000 Kg |
| (vi) Spare Nitrogen Cylinders of 50 Ltr.cap   | : | 8 Nos.  |

## 2.6 Hose Tender

Approximate Cost: Rs. 30 Lakhs.

A hose tender or a hose laying tender is a firefighting vehicle that carries different types of hoses. The chassis for this vehicle is similar to water tender chassis as mentioned earlier. The hose tender normally is contained with 63 mm hose of 50 numbers. The overall specification for hose tender in India is IS2930.

### 2.6.1 CHASSIS

The fabrication of Hose Tender shall be carried on Tata LPT 912 EX/38WB, CAB 497TCIC BS III, and power steering. The chassis is without drivers cab, windshield and wiper.

### 2.6.2 MATERIAL SELECTION AND TREATMENT

The choice of material to be used in construction of the appliance shall be made with a view to combine lightness with strength and durability. There shall not be any use of timber for body construction.

### 2.6.3 BODY WORK/ STOWAGE/ CABIN

Enclosed accommodation with single compartment for three people with driver and a officer in the cabin. The driver seat shall be of adjustable type. The design/ of the cab shall be such that it affords max. possible vision. Two-hinged doors/shall be provided on both sides of the appliance for easy access to driver and crew. Both doors shall open outward and hung forward. The locking arrangement shall be with double catch striking plate. Non-slip step and grab rails coated with plastic shall be provided to assist the driver and crew to get in and out. All the seats shall be fitted with 100 mm thick high-density cushion. All windows shall have safety glasses and all glasses be fitted with winding type regulator. Two numbers of sun visors shall be provided one on each side. The construction of cab shall be such that the roof shall be capable of supporting the weight of two men without damage.

### 2.6.4 CONTAINER

1. Skeleton Structure: MS Square Pipe 45 x 45 x 2 mm
2. Cross Member:
  - (a) 100x50x6 mm M.S. Channel
  - (b) 'u' Bolt 16 mm diameter with Nylock Nut
3. Flooring Support: M.S. Angle 35x35x5mm
4. Outer Sheet Paneling: 16 gauge thick Aluminum Plain sheet
5. Inner Sheet Paneling:
  - (a) Roof: 16 gauge thick aluminum Plain Sheet
  - (b) Sides: 16 gauge thick Aluminum chequered plate
6. Flooring: Full Bed Flat Type consist of 10 gauge Aluminum chequered plate
7. Doors: At the rear Two doors full opening flap type with heavy duty hinges and pad lock arrangement.
8. Mudguard: 16 gauge M.S. Sheet
9. Roof Lights: Six Numbers to be provided
10. Foot Step: Necessary foot step to be provided at rear for climbing

11. (a) Length of the body: As per the length available on chassis  
(b) Breadth of the body: 2270 mm  
(c) Height of the Body: Inside height of the body is 1900 mm

#### **2.6.5 REVOLVING LIGHT/ FIRE BELL**

Two revolving lights of amber color shall be fixed on the roof of the cab (One on either side). A two-tone siren with necessary amplifier and operating control shall be fitted in front of officer's seat. The revolving light and electronic two-tone siren shall be of "Grand Make" Model GM 103 TF and GES - 40 FTF or equivalent.

One brass fire bell of 250 mm diameter natural tone carillon shall be mounted externally and capable of being operated from within the crew compartment. The weight of bell shall not be less than 8.5 Kg

#### **2.6.6 WORKMANSHIP AND FINISH**

All parts of the appliance shall be of good workmanship and shall have streamline finish. All mechanical and other part shall be such that parts normally required to be replaced can be supplied and fit correctly.

#### **2.6.7 PAINTING**

- (a) Outside - Dupont Paint P.O. or Similar Brand's Red  
(b) Inner Roof - Cream color  
(c) Structure - Epoxy coating  
(d) Under chassis -Black color

Fire Service insignia shall be painted on both side of the appliance in yellow & black. (one side in English & other side in Regional Language)

#### **2.6.8 ACCESSORIES AND EQUIPMENT**

Pyroprotat delivery hose 50 mm dia., 30 meters. in length having IS 636 Type-B mark in length with GM coupling duly binded with copper wire, coupling instantaneous male & female conforming to relevant IS specification shall be provided / stowed in the vehicle. The total nos. of hose lengths shall be 75.

#### **2.6.9 INSPECTION/ TESTING AND ACCEPTANCE**

The diameter, thickness spacing, etc. Of the extruded aluminum, elements shall be inspected. Stowage element shall be seen for the easy maneuverability for laying of fire hoses. All the other necessary fittings will be provided as per M.V.I rules. If any deficiency pointed out by M.V.I during passing of vehicle, will be rectified vendor free of cost.

## 2.7 Aerial Ladder Platform

Approximate Cost: Rs. 500 Lakhs.

The Aerial Ladder Platform shall be designed specifically for the purpose of firefighting and rescue and to enable firemen to go up over and above the other side of any obstruction. It shall comprise of main boom with Telescopic sections and Articulated/telescopic Boom with a cage mounted at the end of the boom and the entire unit shall be mounted on a Turn-Table on a Heavy Duty Diesel - Engine chassis of Volvo or Mercedes Bens or MAN or similar make chassis, 6X4, having approx 5585 mm Wheel Base (as per CMVR 1989) with fully factory built cabin and suitable capacity PTO. The Vehicle Chassis shall comply with the emission norms in force.

The Aerial Ladder Platform shall be designed as per the design, operational stability and structural strength based on the criteria laid in EN 1777 and other norms and standards applicable for elevated raised platforms used for Firefighting and rescue operations and the certificate to that effect issued by the competent agency shall be enclosed with the tender. The vehicle shall be CE marked.

The Aerial Platform shall be capable of use at any angle of elevation without any reduction of load capacity of the cage. It shall also rotate 360 degree at any angle of elevation as well as below ground level subject to boom remaining clear of vehicle body and or any obstruction.

The appliance shall be compact and fast on the road and easily maneuverable in the crowded streets and around sharp corners. The overall dimensions shall not exceed the limits specified herein.

The working height of the Aerial Ladder Platform shall not be less than 42mtrs from the Ground and the Horizontal outreach shall not be less than 22mtrs. The horizontal outreach of the cage 22 meters shall be attainable till the height of min. 15mtrs from ground.

A Telescopic Rescue Ladder shall be attached on the right hand side of the booms. The ladders shall be provided with sufficient width and handrails for rescue of the people at any height during rescue operation.

The Aerial Ladder Platform shall be electro hydraulically controlled, permitting precise and easy operations under the most difficult conditions, with ample reserve strength and stability. Full safety interlocks shall be incorporated in the design to ensure complete safety in operations and long years of reliable and trouble free service, as far as possible, the system shall be fail proof.

The design of the ALP shall allow a very large safety margin for extreme operating and climatic conditions. The safe working loads ratings shall include an allowance for the weight of water system and the reaction from the monitor jet while operation. The Vehicle shall have a leveling system to adjust axial and transverse movement to an angle not less than 7 degree.

There shall be a full back up system for all boom movements and outrigger movement in case of failure of main system. The Complete Movement of the ALP shall be computer controlled and the system shall be checked for interference sensitivity according to IEC-810-2. The Control system of the ALP shall be fully tropicalised and able to operate in the temperature range up to + 60 degree centigrade and in a dusty and Humid condition without reducing the maximum operating limits.

### 2.7.1 CHASSIS

- The fabrication of Hose Tender shall be carried on Tata LPT 912 EX/38WB, CAB 497TCIC BS III, power steering. The chassis is without drivers cab, windshield and wiper.
- The Chassis shall be of Volvo or Mercedes Bens or MAN or similar make, 6X4; having approx, 5585 mm Wheel Base (as per CMVR 1989) with fully factory built cabin and suitable capacity PTO. The Vehicle Chassis shall be a Right Hand Drive and shall comply emission norms in force.
- The Chassis shall be homologated from the appropriate authority in India in case not already an approved model.
- The engine shall be six cylinders, inline, Diesel with direct injection, turbo charged with intercooler.
- The engine shall develop min. 300 hp (220 kW.)
- The clutch shall be single plate, dry type, and power assistant.
- The gearbox shall be synchronized with crawler gear.
- Rear Axle shall be Tandem Bogie type with Hub reduction and differential lock between the wheels and axles.
- Chassis frame shall be 'C' Channel section made of high strength steel with cross members.
- The Steering shall be integral power steering with collapsible steering wheel and column.
- The Front Suspension shall be leaf spring type and the rear suspension shall be reverse scamel type with shock absorber in the front.
- The Brakes shall be dual circuit airbrakes, with parking brakes acting on rear wheels.
- Fuel Tank - Capacity shall be min 300ltrs with lockable fuel cap.
- The Chassis shall be provided with 11.00R x 20 radial Tyres or equivalent - 11nos with spare tyre.
- The chassis shall be provided with single day type cab with RED color, made from high strength steel fully trimmed, external panels hot dip galvanized with hydraulic cab tilting mechanism. The Cab suspension shall be provided. The cab shall be provided with adequate ventilation, rear view mirrors, windscreen and windows, adjustable driver seat, wiper system and along with all other standard fitments.
- The Electrical system shall be 24V, with suitable capacity batteries & Alternator for charging the batteries.
- The chassis shall be supplied with standard tool kit, hydraulic jack of 20ton capacity, operator & workshop manuals.
- The Chassis shall be fitted with gearbox mounted, suitable capacity Power Take Off Unit to drive the hydraulic pump for boom movements.
- The Chassis shall be directly procured by the tenderer conforming to above specifications and shall be got homologated with the appropriate authority in India. The Transportation responsibility of the chassis up to tenderer manufacturing facility lies with the tenderer. The Chassis shall be insured while in transit.
- The Chassis shall comply all the provisions and enactment of Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989 and any amendment from time to time.

### 2.7.2 OPERATING REQUIREMENTS AND DIMENSIONS OF FINISHED APPLIANCE

The Vehicle shall comply the following requirements-

Max working Height	: 42mtrs
Height to working cage bottom	: 40mtrs
Max Working outreach with 400kg cage load	: 22mtrs
Reach below ground level	: 5.0mtrs
Rotation - Continuous	: 360 degree
Safe working load in the cage on hard level	
Ground with dry monitor	: 400 Kg Minimum
Safe working load with monitor in the cage	
Delivery up to 2250 LPM	: 200 Kg Minimum
Loading capacity of lifting eye under the	
Cage (cage empty)	: 400 Kg Minimum
Operations at maximum outreach with	
Full working load permitted in wind speed up to	: 12.0 Mtr/ Sec.
The unit will be suitable for test at the load	: 500 kgs at hard level ground
Operating time at full stroke for all operations	: As per EN 1777
Overall length in traveling position	: 11.25mtrs max
Overall width of the vehicle	: 2.50mtrs max
Overall Height in traveling position	: 3.85mtrs max
Maximum width of the vehicle when	
Jacks are fully extended on both sides	: 6.0mtrs max
Gross Vehicle Weight	: 25 tons approx

### 2.7.3 CONSTRUCTION

The appliance shall be robust in construction; materials used in construction shall be carefully selected for lightness and durability. Use of timber shall be restricted in bodywork and use of rubber shall be avoided as far as possible. Ferrous metal parts shall be treated for anti - corrosion by a method other than electro-plating.

### 2.7.4 BOOMS

The vehicle shall perform the following functions/ operations

- i. Elevation
- ii. Depression
- iii. Extension & housing of telescopic sections
- iv. Rotation 360 degree in either direction

- All the operations shall be electro-hydraulically operated with the help of hydraulic cylinders, wire ropes, chain etc. The system shall be purpose built to provide smooth takeoff, variable speed range and smooth slowdown, based on the criteria laid down under EN 1777 or any other relevant standards applicable for these kind of vehicles.

- There shall be two/ three booms, the first boom with telescopic extension providing direct movement and the other articulated/telescopic booms with vertical movement of approx. 180 degrees. The other booms shall provide an up-and-over capability of approx. 8 m throughout its vertical movement. Based on the selected outrigger position and cage load, the system selects automatically the maximum outreaches to all directions. The system capacity shall enable various outreach curves for each direction.
- The booms shall be trapezoidal section for minimum wind catching area, welded construction; welding method shall be of latest technology to provide high durability and extreme accuracy. For high strength and minimum flexing of the boom sections only high tensile strength steels shall be used for load bearing structure.
- The main boom elevation and lowering shall be controlled by two hydraulic cylinders that both have their separate safety devices and can alone carry the entire load in case of failure of any one of the cylinders.
- All telescopic sections of the first boom shall move in a synchronized way and there shall not be any intermediate jerks during extension / retraction. Automatic slowdown mechanism at the beginning of the movement as well as end of the movement shall be provided to all boom movements. All the moving sections shall be fitted with adjustable guides/ rollers to provide smooth and accurate movement. Various maintenance points shall be located well at hand either outside the boom or behind easily removable covers. The telescopic movement of the boom sections shall be controlled by the combination of hydraulic cylinder and double chains.
- All booms shall be internally and externally primed and painted for long life span, treated against rust and corrosion.

### 2.7.5 HYDRAULIC CYLINDERS

- The Hydraulic cylinders shall be double acting, fitted with lock valves so as to prevent booms, working cage from lowering or the outriggers from retracting in case of pipe or hose failure.
- The cylinders shall be provided with automatic dampers to prevent the pressure shocks and shall dampen the movement when a mechanical stop is reached.
- Retraction of the outriggers shall be automatically prevented as soon as the booms have been lifted up from their transport position by way of electrical OR Hydraulic interlock system.
- The main boom elevation and lowering has to be controlled by two hydraulic cylinders that both have their separate safety devices and both can alone carry the entire load in case of failure of any one of the cylinders.
- Lifting of the booms from the transport position shall be prevented before the outriggers are in support position and there shall be a limiting circuit to prevent damage to the Drivers cabin by the first boom when not clear of the cabin.
- All the movements shall be automatically limited in their extreme position and the working cage shall be prevented from working outside of the permitted working range in any position.



- An emergency stop switch shall be provided on both control panels, which shall switch off the hydraulic pressure of all movements and shall stop the vehicle engine. The unit shall be supplied with a manual lowering System and Emergency Hydraulic Back-up System.

#### **2.7.6 TURN-TABLE**

- The turntable shall be fully integrated steel structure containing center post, slip rings, water line, etc duly fastened to the main frame by means of slewing ring.
- The rotation for the turntable shall be controlled by hydraulic motor with brakes through oil immersed reduction unit.
- The base control station shall be attached to the turntable to rotate with it and be accessible in all positions of the turntable.
- The hydraulic distributor (center post) shall be mounted in the center of the turntable at an accessible position and shall carry the hydraulic pressure and return lines, electrical supply lines & water line allowing continuous rotation in either direction.
- The fasteners retaining turntable to the rotation mechanism shall be of proper grade and shall be torque properly.
- The rotation gearbox fastener shall be of proper grade and torque with proper backlash.
- There shall be provision for the manual rotation of turntable in case of failure of hydraulic system.
- Pins securing the hydraulic cylinders to boom and turntable shall be properly installed and secured.
- The hydraulic hoses, tubing and connections provided in the turntable shall be free from kinks, chaffing or leaks.

#### **2.7.7 MAIN FRAME**

The main frame shall be welded, box section type made from high tensile steel plates and shall absorb all the stresses generated by platform and outriggers. The front mounting bolts of the mainframe shall be spring loaded to allow the chassis frame to flex when the outriggers are fully down to avoid any stress concentration on the chassis frame. The main frame shall incorporate hydraulic oil tank, outrigger beam housing, and it shall be bolted to the chassis frame and the slew ring support plate shall be welded to the top of the main frame and shall be precision machined.

#### **2.7.8 STABILIZING/ JACKING SYSTEM**

- The Jacking system shall consist of hydraulically operated four outriggers mounted in their housings in the main frame. Each housing shall be fitted with adjustable guides to provide smooth and accurate movement of the outrigger beam. The outrigger piston rods shall be completely protected by closed steel profile.
- The Jacks shall be H-type construction, each outrigger shall have two separate hydraulic



cylinders, the first of which pushes the horizontal outrigger beam out and the second shall push the vertical Jack down.

- The jack shall be provided with ground pressure sensors/switch, which shall be correctly actuated before the booms are operated to ensure proper stabilization.
- Each Vertical jack shall be provided with self-aligning footplate to spread the load evenly and allow the operation on uneven ground.
- The Jacking shall be able to level the vehicle up to 7 degree sideways and fore and aft with manual and automatic leveling system.
- The automatic jacking system shall be controlled preferably by handheld remote control box provided with backlit push buttons for following operations.
  - (i) Left side outrigger beam out.
  - (ii) Right side outrigger beam out.
  - (iii) Automatic leveling
  - (iv) Outrigger back to transport position
- All the jack movements shall be infinitely variable within a jacking width of 6.0mtrs.
- The Jacking systems shall allow operating each jack individually and the jack projection shall be recognized by the controlling system and the maximum outreach shall automatically be calculated as per the jacks width.
- The jacks shall be controlled individually or in pair with lever /joystick/button and the control panel shall be situated in such a position that, the operator will have clear look to the right and left hand side while extending the jacks. The control panel shall be located at the rear side of the vehicle.
- Yellow Flashing warning lights shall be provided at the outer most point of the jacks to identify the position of the jacks during night operation.
- Four wooden spreader plates shall be provided for the use, when the vehicle is to be operated on soft ground.
- The Vehicle shall be provided with inclinometer which will measure both fore, aft and Sideways inclination of the vehicle up to minimum 10 degree.
- The Jacking system shall also have automatic "ONE BUTTON" Variable jacking system with two independent automatically operating and self-controlling safety systems to prevent an unsafe configuration.
- The Jacking / Stabilizing controlling box shall be located in such a way that it allows operator to see outrigger at all times preferably remote control box with wonder lead containing all the control levers, switches, and indication lamps for the operation of stabilization system.

- In addition, the following controls shall be provided on jack control panel:
  - (v) Starting of chassis engine
  - (vi) Stopping of chassis engine
  - (vii) Activating the outrigger controls
  - (viii) Operating hour gauge.
  - (ix) Switch for the battery driven back up for the hydraulic system
  - (x) Visual indications for leveling of the vehicle (fore, aft & sideways)
  - (xi) Emergency stop
  - (xii) Controls for the automatic jacking
  - (xiii) Engine start / stop button for diesel engine of standby system.
- The locker containing outrigger controls shall be fitted with an automatically operating door switch and a light for night operation.

### **2.7.9 ELECTRONIC SAFETY AND OUTREACH SYSTEM**

The computer-controlled system shall allow the outriggers to be positioned and to select the working cage load according to working situation. The system shall be capable to select automatically the maximum allowed outreach to front, rear, right and left side. Based on calculations and parameters saved in the system to guarantee exactly the same outreach regardless of the external influences like wind speed and direction, temperature, friction of the cylinders, etc.

The display units of the system shall show maximum possible outreach and position of the working cage in real-time along with other details.

The electronic system shall be approved according to the valid standards and directives. The system shall be EMC tested (EU directive 89/336/EEC) and CE type tested by TUV or any other appropriate agency.

### **2.7.10 CAGE**

The working cage shall be fixed to the boom with proper pivoting point.

- The cage shall be made of tubular steel / Aluminum / stainless steel profile, welded together and painted with special paint with high durability. The dimensions of the working cage shall be approx. 2.0 m (length) x 0.9 m (width) x 1.1 m (height) and it shall be fitted with an inward opening door located at suitable place to enable safe access to the cage. The top railing shall be part of the cage door so that entering into the cage without bending is possible. The rescue entrance shall be located in the front and top railing is formed for safe and easy access.
- The cage shall be designed for 400Kg working load and shall be tested to 1.25 time the working load.

- When the load selection is made at turntable or cage, the system shall automatically show the maximum outreach to all directions with selected cage load and outrigger position.
- The control panel in the cage shall be fitted in such a way that the operator shall see the booms clearly at all the times.
- The cage shall be kept horizontally leveled in any position of the booms. An automatic hydraulic device shall control the leveling system with fully automatic and independent safety circuit in case of an uncontrolled leveling failure. There shall be a master switch for the automatic leveling system, so that it can be isolated and then manually controlled system activated. The leveling of the cage shall be controlled by hydraulic actuators and use of chains and wire ropes are forbidden.
- The working cage shall have capability to turn 45 degrees to each side from its center position. The movement shall be powered hydraulically with controls in the working cage and at the turntable control panels. The center position of the cage is indicated by a visual indication at both control panels.
- At the front of the working cage there shall be a drop down rescue platform with automatically operating safety railing to provide additional safety during rescue and firefighting. The dimensions of the rescue platform shall be approx. 1.30 m x 0.5 m with minimum 180Kg load carrying capacity.

#### **2.7.11 HYDRAULIC SYSTEM**

- The Hydraulic power shall be provided by a reliable and adequate capacity variable displacement axial piston pump for boom movements and separate pump for cage leveling system to ensure positive cage leveling at all the time even in the case of failure of main pump, which shall be driven by the vehicle power take off.
- When no operation of the aerial device is activated, the pump shall rotate on minimum flow and minimum pressure. When one of the movements is operated the control valve automatically increases the pressure to a pre-set constant level and the oil flow to the amount that is needed for the movements activated. The flow of the pump shall be sufficient to give the supply of Hydraulic oil at required pressure to all the movements activated simultaneously at full stroke without affecting the preset speed.
- There shall be a provision of instant couplings for attachment of manometer in each pressure line for checking pressure of each circuit.
- The filtration system of the hydraulic oil shall consist of suction strainer in the suction line, pressure filters in each pressure circuit, air filter on the reservoir. All the pressure filters shall have blockage indicator.
- All hydraulic cylinders shall be double acting with hard chrome plated piston rods and shall be fastened by means of self-aligning bearings to prevent lateral forces from damaging the seals or piston rods of the cylinders.
- Hydraulic oil tank shall be integrated or fitted into the main frame and shall have a proper heat dissipation system. The tank shall be fitted with oil level gauge, temperature gauge, and suction connections with closing valves for easy maintenance and draining outlet

with closing valve.

- There shall be hydraulic oil cooler for continuous use in hot temperature.

#### **2.7.12 BACK-UP FOR THE HYDRAULIC SYSTEM**

There shall be a separate single cylinder diesel engine of HATZ make, (silent pack) mounted at suitable place, preferably in one of the lockers driving the hydraulic pump, which will provide independent means of hydraulic power in case of failure of main engine of vehicle. The Diesel engine shall have sufficient power to drive all the movements of the booms but at a reduced speed. The Engine shall be able to start from all control panels.

In addition to the above, there shall be battery driven Hydraulic pump, which provides independent means of hydraulic power in case of failure of main engine and standby engine of vehicle. The battery pump can be operated from all control panels.

#### **2.7.13 CONTROLS AND SAFETY**

- The Electrical supply needed for control system shall be taken from the vehicle battery, which shall be charged when the engine is running.
- When the vehicle is in operation yellow flashing warning lights mounted on the outriggers shall automatically remain on.
- The engine starting and stopping switch shall be provided on all control panels and the engine speed shall be increased to the preset level as soon as any one of the control lever is operated.
- All boom and rotation movements shall be controlled electro-hydraulically by means of proportional valves. The proportional valve shall not be sensitive to changes of ambient or oil temperature, and shall provide smooth, safe and very accurate movements even in most severe operating conditions.
- The speed of the first boom for lowering and extension shall be automatically reduced at maximum outreach. The first boom lifting speed shall be reduced before the maximum elevation.
- All control movements can be performed by the control system from both control panels and the outreach can be selected by the positioning the outriggers. The variable system shall consist two displays, the graphical display and real time information about the outreach and the cage position and also to show possible movements according to cage position by animated arrows. In the text display there shall be main texts for:
  - (i) Warnings
  - (ii) Emergency situations
  - (iii) Help manual
  - (iv) Fault finding system
- Signal lamps shall be provided for following functions:
  - (i) For the outriggers, in transport position in driver's cab
  - (ii) For the outriggers working position on all control panels

- (iii) For the P.T.O. engaged in the driver's cab
- (iv) For the transport position of the booms in driver's cab
- (v) For the middle position of the rotation on the turntable and cage control panel.
- (vi) For the exceeding of the safe working load in the cage on the turn-table and cage control panels

#### 2.7.14 TURN-TABLE AND CAGE CONTROL PANELS

- The turntable control panel incorporating all control levers and safety system indicators shall be fitted with a rotatable arm at the side of the turntable. The control panel shall be placed and locked conveniently in its operating position to provide the operator with an excellent view over the different indications of the safety systems.
- The control panel can be rotated and locked in a position enabling direct access from the decking of the vehicle into control station.
- The control station shall be fitted with convenient adjustable seat to provide comfort even in case of prolonged operation. The platform underneath the control position shall be covered by non-slip aluminium plate.
- The control panels at turntable and cage shall be exactly alike which will reduce the risk of confusion amongst operators under stress or even panic. Both the control panels shall be provided with weather protection covers/ box.
- The turntable control panel shall have a change over switch to select the control station from which the operation is performed.
- Both control panels shall be fitted with following warning, indication and control devices, and shall be marked by clear symbols for easy recognition.
  - (i) Visual and audible indication for exceeding safe working load
  - (ii) Visual warning for activation of working cage collision guard system
  - (iii) Visual indication for ground pressure of the outriggers
  - (iv) Visual indication for the rescue ladder "Rungs in alignment"
  - (v) Visual indication for the center position of the booms
  - (vi) Visual indication for the center position of the working cage
  - (vii) Starting and stopping of chassis engine
  - (viii) Switch for the operating battery driven pump for hydraulic back-up system
  - (ix) Starting and stopping switch for standby diesel engine for hydraulic back-up system
  - (x) Joystick control levers for each movement
  - (xi) Push buttons/ joystick for cage slewing
  - (xii) Emergency stop button
  - (xiii) Overriding of the automatic working cage leveling system
  - (xiv) Manual operation for the working cage leveling system.
  - (xv) A remote service box which will help in verifying the operational data of the vehicle from remote location via the GPRS based internet connectivity though any computer shall be provided.

- (xvi) The vehicle shall be provided with auto self-closing function which will allow the operator to close the complete vehicle including the jacks by one button operation.
- (xvii) A memory function shall be provided in the computer system of the vehicle wherein the same repetitive operation can be done automatically by the vehicle.

#### **2.7.15 CONTROLS AND INDICATORS IN DRIVER'S CAB**

The following control and indicators shall be provided in driver's cabin.

- (i) Visual warning for outriggers in traveling position
- (ii) Visual warning for any of the equipment lockers being open
- (iii) Visual warning for the booms not being fully in transportation position
- (iv) Switch with visual indication for rotating beacons
- (v) Switch with visual indication for siren unit
- (vi) Microphone for the public address system

#### **2.7.16 SAFETY DEVICES**

- All the hydraulic cylinders shall be fitted with lock valves directly integrated into the cylinder structure to prevent the booms, the working cage or the outriggers from retracting in case of a pipe or hose failure.
- Retracting of any of the outriggers shall be automatically prevented as soon as the booms have been lifted from their traveling position. Similarly lifting of the booms from the traveling position shall be prevented until the outriggers have reached the ground pressure.
- The leveling system of the vehicle shall give audible warning at cage & ground level if permitted inclination increases due to changing ground conditions
- All boom movements shall be limited at their extreme positions making it impossible for the operator to reach an unsafe configuration by normal means of operation. The movements having direct influence on the stability of the ALP shall be fitted with two separate limiting circuits, the first one retarding and stopping that particular movement, and the second one deactivating the whole electric and hydraulic system shall the first circuit fail.
- All major movements such as lifting of the first boom to its maximum elevation, and extending the telescopic movement or lowering the first boom at the maximum outreach shall be fitted with slow-down devices to provide smooth deceleration, and starting of the movement shall be retarded for smooth acceleration.
- Inadvertent damaging of the drivers cab by the main / first boom shall be prevented by a system preventing lowering of the booms and rotation movement when the booms are near the driver's cab.
- An overload warning system shall be fitted to give and audible and visual warning in case of exceeding the safe working load in the cage and at the same time boom movements are slowed down and outward boom movements shall be stopped.
- A cage collision guard shall be provided and shall be integrated to cage load sensor to

provide additional safety when operating in darkness or in dense smoke. The system shall stop all movements.

- An emergency stop button shall be provided on both control panels to provide immediate and complete “freezing” of all systems in case of an unexpected emergency.
- All the control levers shall be “Dead Man” type and shall automatically come to zero position when released.
- There shall be a manual lowering system, to lower the booms and bring the working cage down onto the ground even if no hydraulic pressure and electric is available with rotation mechanism.
- When one of the outriggers has not enough ground pressure, the system shall give an audible and a visual alarm. If two outriggers lose ground contact, unsafe boom movements shall be stopped.
- The cab of the vehicle shall be protected from damage by the booms or working cage. Working in front of the vehicle close to the cab shall be possible. When in the cab protection area, the movements of the booms shall slow down and stop smoothly however; the opposite movement of the booms and the cage shall be possible to get out of the cabin protection area. Cab protection system/ mechanism shall be manually overridden by push button.
- There shall be a system, which shall bring the rungs of the ladder section in alignment automatically.
- The vehicle shall be equipped with electrical sensors for temperature and pressure of the Hydraulic oil. The temperature and pressure shall be shown on every display unit.
- The vehicle shall be fitted with tilt alarm to give audible & visual alarm on display if the vehicle is leveled incorrectly. The tilt alarm angle shall be adjustable.
- The system of the vehicle shall be based on clear and easy to understand symbols. If texts are used on master screens, the operator shall be able to change the language in use. All measure units of master screens shall be changeable to locally used format by operator.
- The wind speed sensor shall be fixed in the working cage. The wind speed shall be shown on every display unit. When wind speed is higher than allowed the system shall give audible and visual alarm. The wind speed meter shall not limit the use of the platform.

#### **2.7.17 BODY WORK AND EQUIPMENT LOCKERS**

- The structure for the bodywork shall be made up of various Aluminium / stainless steel profiles properly fixed together by riveting, bolting or welding.
- The complete external paneling of the rear body shall be made from Aluminum sheet fitted to the structural member either by gluing or riveting.



- The complete flooring of the rear deck shall be made from nonskid aluminium chequered plate of 3.0 mm thick properly riveted or bolted to the superstructure members.
- For the easy access to the rear deck from ground level, there shall be sufficient nos of recessed steps on both sides of the vehicle provided with suitable grab handles.
- Sufficient numbers of lockers shall be provided on both side of the vehicle for keeping various accessories and equipments. The locker shall be so made that load distribution on both sides is equal. All the lockers shall be provided with rolling shutters properly sealed for water and dust ingress. All the doors of the lockers shall be fitted with automatic switches activating the light as soon as the door is opened and also activating the warning light in Drivers cab.
- There shall be a bench type crew seat suitable for 5 firemen fitted on the rear deck just behind the drivers cabin. This seat shall be properly upholstered and shall be provided with safety belts.

### **2.7.18 THE WATER SYSTEM**

The waterway shall be completely made of anti corrodible steel only. Aluminium or SS pipes shall not be used for the waterway. The nominal diameter of the water way shall be minimum 75 mm. There shall be one 2 ½" (63 mm) male inlet (as per BS standard) with a closing ball valve at each side at the rear of the vehicle from where the water line leads through the center post in the turntable up into the working cage where the water monitor is mounted. The telescopic water pipe shall be provided on the side of booms properly supported and protected with flexible pressure hose on the boom knuckles.

The water line shall be protected from possible over pressure by means of relief valves (set at a pressure of 12 kg/cm<sup>2</sup>) mounted underneath of the turntable. A Telescopic water pipe shall be provided on the side of the booms, which shall be made of anti corrodial steel only. Aluminium or SS pipes shall not be used for the waterway. Moving sections of this pipe shall be externally ground & chromium plated for long life. Seals between the sections are of low friction type and can be easily tightened if so required. On the other booms, a fixed stainless steel pipe shall be installed and at the boom pivoting points, flexible and specially reinforced pressure hose shall be used. All hoses shall be fixed to the pipe with reliable span-lock connections.

An additional outlet of 63mm (as per BS standard) with female coupling and closing ball valve shall be provided to the water piping in the cage. There shall be drain cocks fitted in the piping to enable to drain the water from the piping after use. On the front side of the cage underneath, a nozzle shall be provided for water spray curtain system to protect the cage occupants from radiant heat. Control valve of water spray curtain system shall be located inside the cage.

The cage shall be provided with 20 meters hose reel with Fog/Jet nozzle and shall be connected to main water line with control valve in the cage.

### **2.7.19 WATER MONITOR**

Water monitor shall be connected to the piping system and shall be mounted outside the cage in a suitable position so that the entire cage floor area can be fully utilized in extreme rescue situations. The monitor shall be made of light alloy and fitted with jet / fog nozzle of Akron/ TFT/ Rosenberger make with maximum capacity of 2300 LPM. The Monitor shall

have Horizontal rotational movement to left and right side and vertical up and down movement. There shall be ball valve type control valve for the monitor and the monitor shall be manually operated.

#### **2.7.20 INTER COMMUNICATION SYSTEM**

There shall be fully transistorized talk back inter communication system fitted between turntable and the cage. The system shall be combined microphone and loudspeaker for hands free operation and shall be located in the cage. The turntable control station is also equipped with microphone, which shall be integrated in the loudspeaker with volume control. The microphone and the loudspeaker shall be sealed properly and it shall be protected from the ingress of water, dust and humidity.

#### **2.7.21 ELECTRICAL SYSTEM**

The electrical supply shall be taken from the vehicle batteries, which are kept, charged when the engine is running. Voltage of the system shall be 24 V DC and all circuits shall be provided with specific fuses depending on the current consumption of that circuit.

When the main current is switched on, yellow flashing warning lights located at each outrigger and booms pivoting point and underneath of the working cage shall automatically be switched on.

2x 24 volts, 70watts, spotlights with swivel mounting bracket shall be fitted at the cage railing in the front side to provide extra safety during night operation. The switch for these lights shall be provided either on the light itself or on both the control panels.

Two rotating beacon lights shall be provided on each side of the drivers cab roof with Amber color lens. The switch for switching the beacons on and off with suitable signal light shall be integrated in the control panel of siren cum public address system. The beacon light shall be either Bosch or Hella make.

#### **2.7.22 SIREN AND PUBLIC ADDRESS SYSTEM**

There shall be an electric siren unit fitted on the roof of the vehicle cabin or at a suitable place with the control unit mounted conveniently inside the driver cabin. It shall have the fast (yelp) and slow (wail) sound modes with integrated switch for rotating beacon lights. Command microphone, which is fitted with push-to-talk switch, allows the public address message to override the siren function. Operations are possible from driver's cabin.

#### **2.7.23 BOOM LADDER**

A telescopic rescue ladder system shall be attached on the right hand side of the booms. The design shall be such that it forms a direct and continuous rescue way with no crossover platforms or similar obstacles at the boom joints. The ladder shall be attached on the boom structure at several points throughout its length for stability even when operated in windy conditions. Extension movement of the ladder is automatically synchronized with the telescopic movement of the first boom and shall not require a separate control device.

Both control panels shall be fitted with visual indication for "safe to climb" (rungs in alignment) position of the ladder. There shall be a safe access at the turntable from the ladder down to the decking for a continuous way from the maximum height down to the ground. The ladder assembly shall be made from aluminium alloy of sufficient strength to withstand the weight of 8 persons at a time and shall have suitable handrails for easy climbing. The distance between two rungs shall not be more than 310mm.

### 2.7.24 DIGITAL DISPLAY UNIT AND FAULT FINDING SYSTEM

The vehicle shall be provided with full color displays situated at turntable and the cage control panels. The display shall show the location of the fault if occurred in the system while operating the vehicle.

The control system of the vehicle shall have self-fault finding system. If any fault occurs during the operation, the system shall find out the same and shall show the location of the defective component on the display. The system shall incorporate simple test screens to enable testing of the working cage and the turntable control panels. The tests shall also cover display unit, push buttons, joysticks and control lamps.

For maintenance purposes the following tools shall be provided as standard supply:

- (i) Faultfinding system and fault register
- (ii) Status screens for sensors, switches, hydraulic valves, control lamps, etc.
- (iii) Total operation and hour meters.
- (iv) Operation and hour meter since last service
- (v) Service counters and alarm for general maintenance.

### 2.7.25 PAINTING

Before painting all surfaces of steel structures shall be carefully shot blasted after which they shall be primed and then applied the coat of approved paint. The final paint thickness of the paint film shall not be less than 100 microns. All the booms shall also be painted from inside.

For very high corrosion resistance of hollow structures such as steel profiles of the working cage, booms, outrigger beams and housings shall be treated with anti-corrosion protection preferably with "TECTYL".

The following Paint shades shall be used:

Working cage & wheel rims: White aluminium RAL 9006

Working cage support, boom Sections,

Turntable and related Cylinders: White RAL 9010

Mainframe, outriggers and Body work including cabin: Red RAL 3000

Chassis frame touch-ups: Chassis original tone

The word "----- FIRE BRIGADE" shall be painted on both side of the vehicle at suitable place as per the instructions of the department.

The emblem of FIRE BRIGADE shall be painted on both side of the vehicle in Natural color

### 2.7.26 ACCESSORIES

Wooden outrigger ground pads/ plates with brackets	- 4 Nos
Working range diagrams, at turntable & in the cage	- 2 Nos
Marking of safe working load in the cage	- 1 No
Unit type marked at the boom	- 2 Nos
Warning labels and instruction plates	- 1 set
Operation and maintenance manuals for ALP, Chassis, standby diesel engine	-2 sets
Plug for 24 V working light at the turntable and in the working cage	- 1 No

Lifting hook under the working cage, capacity 400 kg	- 1 No
Hydraulic pressure gauge	- 2 No
Set of tools & accessories required for the repairs & maintenance of ALP, chassis, & other systems	- 1set
Safety belts for cage occupants	- 5 Nos

#### **2.7.27 INSTRUCTION MANUALS**

Two sets of complete instruction manual for the operation and maintenance of Aerial Ladder Platform unit (including all systems), stand by systems, chassis and itemized spare parts list shall be supplied along with electrical circuit diagrams, hydraulic circuit diagrams. All the manuals, circuit diagrams, literature etc shall be in English language.

#### **2.7.28 STABILITY**

The stability of the vehicle (in traveling position) when fully equipped and loaded (excluding crew member), with hydraulic platform resting on the resting stand and without extending the stabilizing jacks shall be such that it shall remain stable and shall not overturn even if the surface on which the vehicle stands has inclination on either side from the horizontal as per the standards stipulated under EN 14043. The tenderer shall specifically mention the angle of overturning in their offer. The manufacturer to that effect shall furnish a certificate at the time of supply.

#### **2.7.29 R. T. O. REQUIREMENTS**

The vehicle shall be equipped with all the accessories required for registration of the vehicle and shall conform to Motor Vehicle Act 1988 and Central Motor Vehicle Rules, 1989 or any amendment incorporated from time to time.

## 2.8 Turn Table Ladder

Approximate Cost: Rs. 500 Lakhs.

The turn table ladder should be designed specifically for the purpose of Firefighting and rescue to enable fireman to go up and down. It should comprise of ladder sections with a cage mounted at the end of top ladder section and the entire unit should be mounted on a turntable.

- a) The entire unit should be mounted on a suitable heavy-duty diesel Engine Chassis. The turn table ladder should be telescopic type.
- b) The turn table ladder should be capable of use at any angle of elevation without any reduction in load capacity of the cage. It should also rotate 360 Degree continuously at any angle of elevation subject to ladder remaining clear of vehicle body.
- c) The height of the ladder, when fully elevated and extended should be not less than 30 meters from the ground.
- d) The appliance should be fast on the road and easily maneuverable in crowded streets and around sharp corners. The overall dimensions should be as compact as possible.
- e) The turn table ladder must be electronically/ hydraulically controlled, permitting precise and easy operations under the most difficult conditions, with ample reserve strength and stability.
- f) Full safety interlocks should be incorporated in the design to ensure the complete safety in operation and long years of reliable and trouble free service.
- g) The design of the turn table ladder should allow a very large safety margin for all operations and in all climatic conditions. The safe working load rating should include an allowance for the weight of the water, in the water system and reaction from the monitor jet when operating.
- h) The ladder should have automatic plumbing system (Leveling system) to adjust at an angle up to 8.5 Degree.
- i) The operation of the ladder should be possible from –15 Degree to + 75 Degree.
- j) There should be a full back-up system for all ladder movements and outrigger movements, in case of failure of main system.
- k) If a computer control system is used, it should be checked for interference sensitiveness according to IEC 810-2 and should comply with interference sensitiveness class B for circuit-linked interference.
- l) All the ladder control system should be fully tropicalised and able to operate in the temperature up to +60 Degree and in a dusty and humid condition without reducing maximum operating limits.

### 2.8.1 CHASSIS

- a) The Chassis should preferably be all wheel & right hand drive, indigenously manufactured on suitable make, full forward control, diesel engine driven
- b) The engine should be Euro-III. The fuel tank capacity should not be less than 160 liters.
- c) The clutch should be single plate, diaphragm type, hydraulically/ mechanically operated.
- d) The gearbox should be synchromesh type having 5/6 forward gears and one reverse gear.

- e) The rear axle should be forged “I” section type.
- f) The rear axle should be fully floating type with adequate capacity for optimum vehicular performances.
- g) The chassis frame should be “C” construction with sufficient numbers of cross members.
- h) The front and rear suspension should be semi elliptical multi leaf spring, preferably with anti roll bar.
- i) The steering system should be integral power steering (Hydraulic)
- j) The tyre size should be readily available in local market.
- k) The braking system should be dual circuit full air brake with pneumatically operated hand brake.
- l) The electrical system should be 12/ 24 volts, negative earth.
- m) A suitable P.T.O. (side P.T.O. or full torque P.T.O.) should be provided depending upon the power requirements for hydraulic pump.
- n) The chassis should have factory built, aerodynamically, full trimmed cabin.

## 2.8.2 OPERATING REQUIREMENTS

The appliance should confirm to following requirements:-

a)	Safe working load in the cage on hard level ground with dry monitor
b)	Safe working load in the cage with monitor delivering full output
c)	Loading capacity of lifting eye

The above weight requirement should be exclusive of weight of any equipment permanently fitted in the cage or on the ladder.

## 2.8.3 DIMENSION OF APPLIANCE

The appliance should confirm following dimensions:-

a)	<b>In operating position:</b>	
i)	The height form the ground	30 Meters.
ii)	Maximum outreach to the front of the cage with full jack width	26 Meters. Approx.
iii)	Maximum width of vehicle when outriggers (jacks) are fully extended	4.5 Meters.
b)	<b>In travelling position:</b>	
i)	Overall length	10 Meters. Max.

ii)	Overall width	2.5 Meters. Max.
iii)	Overall height	3.5 Meters. Max.

#### 2.8.4 CONSTRUCTION

The appliance should be of robust construction material used in construction should be carefully selected for lightness and durability, use of timber should be restricted and use of rubber be avoided as far as possible. Ferrous metal parts should be treated for anti-corrosion by a method other than electro plating.

#### 2.8.5 JACKING SYSTEM

- The jacking system should consist of four stabilizing jacks situated at each end of the main frame to enable effective leveling even on rough ground. The jacking system should be powerful and quick acting hydraulically operated.
- The jack should be of rectangular steel box section, designed to protect the operating cylinder against mechanical damage. Large swiveling end plates should be provided.
- The jacking system should be horizontal vertical “H” type jacking system with hydraulic axle locking mechanism on rear axle. All the jack movements should be infinitely variable within a maximum jacking width of 4.5 meters.
- The jacking system should allow operating each jack individually, the infinite jack projection should be recognized on board by the controlling system, and the maximum outreach should be automatically calculated as per the jack width.
- The jacks should be controlled individually or in pair with lever/ joystick and the control panel should be situated in such a position that, the operator will have a clear look to the right and left hand side while extending the jack. The control panel should be preferably at the rear of the vehicle.
- Yellow flashing warning lights should be provided at the outer most point of the jacks to identify the position of the jacks during the night operation.
- Four wooden spreader plates should be provided for the use when the appliance is required to be operated on soft ground.

#### 2.8.6 LADDER SET

- The turn table ladder should be designed to perform the following functions/ operations:-
  - i) Elevation
  - ii) Depression
  - iii) Extension
  - iv) Housing
  - v) Rotation of 360 Degree continuously in either direction
- All the operations should be power operated with the help of hydraulic cylinders, wire ropes and cables etc. This system should be purpose built to provide smooth take-off, variable speed range and smooth slow down.
- The ladder should consist of four sections having a height of 30 meters. (Upper ladder rung or cage floor) made of high grade, corrosion resistant steel and has a minimum wind catching area. The ladder section should be extended and retracted telescopically and simultaneously.



- The lower ladder section (base Ladder) should be bolted on to a turret. The sliding sections of ladder should be extended and retracted with the help of double acting hydraulic cylinders or via wire ropes or the combination of both. The movement of the ladder should be simultaneous.
- The extension and retraction cylinders or wire rope should be so laid, that it should not cause any hindrance for climbing to a fireman. The ladder rungs should be anti skid design to avoid slipping of a person while climbing up or down the ladder. The extension/retraction ropes should have tension adjustment- mechanism.
- A visual indication lamp should be provided on main control consol and cage control consol for “Rung in alignment at a convenient position”.
- The ladder should be possible to elevate from –15 Degree to +75 Degree angle. The rotation movement should be continuous through 360 Degree at all angles of elevation except for the cabin protection area. In driving condition, the ladder set should be placed on the ladder headrest. The ladder should be possible to level with the ground in 8.5 Degree in either direction when used on inclined ground.
- All the sliding section should have a maintenance free nylon/ steel rollers for sliding movement and means should be provided for the lubrication of these rollers at an easily accessible position.
- Hook on type additional ladder should be provided for the access to main ladder assembly from the ground. A lifting eye should be provided at the head of the ladder section with a load capacity of 4000 Kg
- An attachment system should be provided at the top of the ladder or in rescue cage for fixing a monitor. The monitor attachment should be quick connect type without the use of bolts and nuts. The monitor either can be permanently mounted on ladder top or can be kept at some other suitable place.
- All main ladder movements such as elevation, depression, extension and retractions and rotation to the left and to the right should be possible simultaneously. Each movement should also be possible individually. The plumbing movement should perform automatically.
- All the ladder movements except rotation, just before reaching the limit position, should be slowed down automatically until rest. In addition to this, the ladder-lowering rate should proportionally decrease with increasing ladder length in order to avoid excessive swinging on the ladder tip when ladder movement stops.
- The functional, ergonomically designed main operating control consol should be provided on the left/ right hand side of the turntable preferably the operator seats back rest and a arm rest should be tilt-able backward up to 30 Degree according to the angle of elevation of the ladder. The following controls should be provided on main control.
  - a. Lever/ Joystick for rotation and elevation and depression.
  - b. Lever/ Joystick for extension and retraction.
  - c. Foot pedal for oil pressure On/Off (“dead man” switch)
  - d. Button for engine start/stop (engine should be automatically set to operating speed.
  - e. Button for plumbing adjustment control on/off.
  - f. Button for rungs in alignment during ladder movement.
  - g. Button for one man/two man/ three-man cage operation.
  - h. Button for control consol lighting on/off.

- i. Button/ Knob for emergency stop.
- j. Volume control for main control stand and top of ladder speaker.
- k. Microphone for intercom system.
- l. Button for search light for illumination at top of ladder.
- m. Lever for emergency operation of jacks and ladder assembly.
- n. Graduated arc with pendulum.
- o. Display monitor for actual ladder operation range.

### 2.8.7 CAGE

- A cage should be made of light alloy material and it should be foldable. There should be sufficient working space for three persons and safe working load should be not less than 270 Kg excluding the equipment permanently fitted in the cage. The cage leveling (Up right position) should be controlled automatically by an electro hydraulic power unit, which will also be used for folding up and down the rescue cage. The controls for folding over and in working position should be integrated into the control panels for the jacking system. The entrance to cage should be provided via a drop down platform, which can also be used for closing the cage.
- The cage should be quick removable type whenever needed.
- An emergency cage operation should be provided in case of primary system failure by means of secondary-independent electro hydraulic system.
- An acoustic signal should be provided if cage fails to come in operating position while the vehicle is being jacked.
- The cage control allows all ladder movements to be performed infinitely variable. During cage operation, the movement should be automatically controlled by the safety system. When the ladder is operated from the cage, the speeds of movements should be the same as it is operated from the main control consol.
- The location of control unit should be on left/ right and side of the cage towards the front. The joystick/ levers operation in the cage should be identical with that of the main consol. The cage control panel is always visible and accessible, even when additional equipment is used such as water monitor.
- The cage control should have operating joysticks/ levers, a display monitor of actual ladder operating range as well as press buttons/knobs for selection of various operational areas. The following control should be provided:-
  - (i) Control lever/ joystick for extension and retraction.
  - (ii) Control lever/ joystick for rotation and elevation/ depression
  - (iii) Foot pedal for oil pressure on/off ("dead man" switch)
  - (iv) Button for engine start/stop (engine should be automatically set to operating speed.
  - (v) Button for rungs in alignment during ladder movement.
  - (vi) Button for control consol lighting on/off.
  - (vii) Button/ Knob for emergency stop.
  - (viii) Button for search light on/off.
  - (ix) Display monitor for actual ladder operation range.

- Two wide-angle floodlights should be provided in front of the cage for illumination of area of operation during night time.
- The cage should be provided with collision safety device to protect the cage against damage due to impact while in operation. All ladder movements should stop automatically when cage collision system is activated.

### **2.8.8 HYDRAULIC SYSTEM**

- A positive displacement pump should be provided to provide the necessary hydraulic power for the jacking and all boom operations.
- The pump should be driven via a power take off through universal propeller shaft.
- A sufficient capacity hydraulic oil tank should be provided with an in built oil filters.
- All the ladder movement should be possible simultaneously without mutual interference and any reduction in the present speed.
- The extension and retraction of the ladder should be carried out by means of extension and retraction of hydraulic cylinders.
- Two hydraulic cylinders should be provided to elevate and depress the ladder assembly.
- The rotation movement should be achieved by means of an hydraulic motor with suitable gear mechanism and braking system.
- All the control valves should be proportional control valves, permitting precise and infinitely variable speed control. The oil pressure should be switched on/off by means of a foot pedal ("Dead man" switch).
- In case of electrical failure, emergency hydraulic operation should be possible and in case of vehicle engine failure, operation can be possible by means of a separate manual hydraulic pump operated via levers mounted at the side of the bodywork, to ensure safe operation from the ground.

### **2.8.9 SAFETY SYSTEM**

- There should be an interlock to prevent ladder operation until the axle lock is engaged and all four jacks have sufficient ground pressure.
- There should be a control light for the axle locking system, which will be mounted on the dashboard. These lights will remain ON when the power take off is switched OFF but the axle lock is not yet disengaged and/or the cage is still in operating position, preferably with warning buzzer.
- There should be two independent drive elements to secure the ladder set of which each is capable of keeping the ladder in its present position, during the ladder movements i.e. "elevating" or "depressing" as well as "extending" or "retracting".
- A "Dead man" switch should be provided at the main and cage control consol, to immediately stop all ladder movement.
- There should be an interlock which only permits the ladder set to be lifted from the head rest and there after other movements are possible.
- There should be a load measuring system for stability of security of the ladder parts. The ladder movements should stop automatically due to projection and/ or additional load such as rescued persons, in conjunction with the jacking widths and the actual remaining load.

- An operating range display should continuously show the total working range and the present load situation. The position of the ladders and the load limit in conjunction with jacking width should be displayed simultaneously.
- It is a basic requirement for stability that the speed of all the movement slows down smoothly and automatically before reaching the final position and automatically stops all movements in the defined final position.
- Due to tactical requirements during operation, there should be a device provided which allows the ladder to reach operational limit beyond the freestanding limit when the ladder head is supported against wall.
- When ladder reaches its operational limits, there should be an automatic final stopping of all ladder movements except for retraction and rotation.
- There should be a driver's cabin protection mechanism, which will stop respective ladder movement to avoid collision of ladder with cabin.
- There should be an impact cut which will stop all ladder movements.
- The automatic hydraulically controlled leveling system (plumbing) should be active at all elevation and inclination angles. It should guarantee that, the rounds are always horizontal up to angle of 8.5 Degree. The plumbing mechanism can be switched off from main control consol.

#### **2.8.10 EMERGENCY SYSTEM**

The hydraulic power of all necessary ladder movements should be provided manually via a separate hydraulic pump. The hydraulic pump should be provided at suitable place for safe and easy operation.

In case of failure of main control system, mechanical emergency operation of all ladder movements should be possible. All the ladder movements i.e. extension/ retraction/ elevation/ depression and rotation to the left and right should be safely controlled with hydraulic system from the main control consol. An emergency system with independent pump should also be provided for manual leveling of cage

#### **2.8.11 OPERATING RANGE DISPLAY**

An operating range display should be provided at main control consol and cage control consol, which will provide useful information to the operator. The various signals coming from control system should be processed and visually represented in the form of text or symbols on the display.

A scaled down representation of the actual available range of operations should be displayed showing exactly the ladder position, projection, ladder length, height and angle of elevation. A microprocessor should monitor all ladder movements and safety systems. If the safe operating limits are reached, the ladder movements should be blocked automatically and a corresponding message/indicator should be shown on display screen.

The display should show test message of operational faults including its consequences. The range display should be illuminated suitably for easy reading during night operation

#### **2.8.12 MONITOR**

The manually operated monitor can either be attached to ladder head or in the rescue cage should be provided with standard 2 ½" B.S. Male coupling. The output of the monitor should not be less than 1200 LPM at 10 bars and throw range should be approx. 40 meters.

The monitor can be moved vertically upward and downward up to -15 Degree to + 60 Degree. The horizontal movement up to 30 Degree left side/ right side when fitted in the

cage. The monitor should be provided with water supply via a pressure pipe of light alloy laid along the ladder assembly.

### **2.8.13 INTER COMMUNICATION SYSTEM**

An inter communication system should be provided between the cage and the turn table controls. The system should be talk-balk amplifier transistorized type with microphone and speaker at main control and cage control.

The system should be powered by the vehicle electrical system. It should be rugged construction to withstand weather conditions. Any connection cables should have an efficient and automatic take-up to prevent a stack or twisting in all the cable when the ladder sections are being operated.

### **2.8.14 BODY WORK**

- The bodywork should be designed to allow maximum accessibility to all areas to be serviced and inspected. Provision should be made for all the major components to be removed easily. Accordingly, lifting eyes should be provided wherever feasible to ensure removal and replacements do not entail unacceptable downtime.
- The super structure of the deck should be made from lightweight steel sections and fasten on the vehicle frame. The structural frame should be adequately protected from corrosion
- The panels should be made of corrosion proof light alloy plates, the exterior of which are anodized for extra protection. The working deck should be covered with light alloy chequered plate of 3 mm. Thickness.
- An access ladder, integrated on the left hand side of the superstructure, gives access to the working deck. Comes with light alloy step protection. Hand grips where necessary should be provided.
- Sufficient number of lockers should be provided for keeping hoses, branches and other accessories. The layout of the lockers should be made, keeping in mind a proper load distribution. The exact location and size of the locker should be shown in the drawing, which should be submitted along with the tenders. All the lockers should be provided with dual-skinned design dust and waterproof light alloy rolling shutters. An automatic switch should ensure immediate illumination of the respective locker. The shutters should be lockable.
- Mudguard should be provided made from corrosion proof material with rubber flaps.
- A crew seat should be provided immediately behind the driver cabin over the deck suitable to accommodate four firemen. Seats will be upholstered properly.

### **2.8.15 ELECTRICAL EQUIPMENT**

All the lockers should be illuminated from inside. Light should be activated automatically as soon as locker shutter is open. Two working area searchlights of 70 W/24 Volts with protected grill should be provided in the cage with swivel joint cable and mounting pins.

A two-tone horn should be provided for traffic warning system. Two each red and blue halogen rotating beacons should be provided and mounted on driver's cabin roof. A battery main switch should be provided for cutting all power from the battery. The location of main switch should be easily accessible to driver and preferably inside the driver's cabin.

All the other lighting of the vehicle should be according to Motor Vehicle act, 1988 and Motor vehicle rules, 1989. A 12/24 Volts, DC siren capable of producing Wail, Yelp and Hi/Lo sounds should be provided, with a switch at officer side.

### 2.8.16 LUBRICATION

The components of the Ladder should be lubricated and sealed for life. For the remainder, where possible an efficient means of lubrication should be provided. In addition, a simple means for checking the oil level should be provided.

Means for draining the oil should be provided by a single plug, which should be easily accessible, and so positions as to drain the reservoir completely. All the greasing points should be provided with grease nipple, which should be easily accessible.

### 2.8.17 PAINT FINISH

- All metal parts, which are exposed to atmosphere and is exposed to water, should be provided with corrosion resistant paints.
- The chassis and wheels should be painted with high glossy black colour aluminium parts natural color.
- The body work, cabin, turntable should be painted with Fire Engine red color-
- Mudguard and the bumpers should be painted with Glossy white
- Lockers and roller shutters should be anodized aluminium.
- The boom assembly should be painted in Glossy white as per IS
- All the steps surfaces and trade plates should be in self-color.
- The words "FIRE SERVICE" and the "EMBLEM" should be painted on either side of the body of the vehicle in white paint.

### 2.8.18 ADDITIONAL ACCESSORIES

a) Following additional accessories should be provided along with the vehicle in addition to standard accessories:

- i) Wooden Outrigger plates 04 Nos.
- ii) Fog/Branch pipe suitable for cage operation. 01 No.
- iii) Set of special tools and equipment required for repairs and maintenance of Ladder. 01 Set
- iv) Suction hose, 3 meters length, with couplings 04 Nos.
- v) Suction strainer, light alloy 01 No.
- vi) Wire Mesh Basket 01 No.
- vii) Coupling spanner 02 Nos.
- viii) Delivery hose with coupling, 15 m x 63 mm, 10 Nos.
- ix) Select flow nozzle 02 Nos.
- x) Collecting breeching, made of light alloy 02 Nos
- xi) Multipurpose saw 01 No.
- xii) Blade for metal cutting, 300 mm diameter 03 Nos.
- xiii) Blade for stone cutting, 300 mm diameter 03 Nos.
- xiv) Electronic Searchlight Complete with rechargeable batteries 02 Nos.
- xv) Mounting bracket for Searchlight, 12/24 Volt 02 Nos.
- xvi) Manual powered combi-rescue tool for cutting and spreading 01 No.

- xvii) Fire Blanket, 160x200 cm 02 Nos.
- xviii) Protective gloves, five finger, made of chromed leather 03 pairs
- xix) Protective helmet 03 Nos.
- xx) First Aid kit, Industrial type 01 No.

### **2.8.19 STABILITY**

The stability of the appliance (in travelling position) when fully equipped and loaded (excluding crew members) with ladder resting in the resting stand and without extending stabilizing jacks or axle locks should be such that it remain stable and should not overturn, if the surface on which the appliance stands is tilted to either side at an angle of 30 Degree from the horizontal. The manufacturer to that effect should furnish a certificate at the time of the supply.



## 2.9 Advanced Rescue Tender

Approximate Cost: Rs. 500 Lakhs.

The tender covered in this standard is designed both for use for fires and special service work, such as:

- a) Large fires in cities or large towns, difficult or special fires requiring the use of Breathing apparatus, special equipment or illumination;
- b) Major electrical fires, for example, in power stations and transformers;
- c) Ship fires;
- d) House collapse, lift, road transport, railway and machine accidents, etc, for which special equipment is required and is not available locally; and
- e) Major leakages of toxic or dangerous gases or gaseous liquids (Hazardous materials).

The appliance shall be designed to carry the equipment listed in Annex A. The equipment shall be arranged on a manner to allow the crewmembers to get ready in vehicle itself.

The appliance shall be suitable geared to provide a road speed of 70 km/h on a level ground. The acceleration shall be such that with a warm running engine, the fully laden appliance shall attain a speed of 64 km/h from a standing start, through the gears. The appliance shall also be capable of being started from rest up a gradient of 1 in 4 when laden.

### 2.9.1 MATERIAL SELECTION AND TREATMENT

- The choice of materials to be used in the construction of the appliance shall be made with a view to combining lightness with strength and durability.
- Timber shall not be used in the body construction.
- The appliance shall be required for use in conditions with constant high humidity and heat. This shall be given full consideration while selecting the materials.
- All metal parts exposed to atmosphere shall either be of corrosion resisting material or treated to resist corrosion.

### 2.9.2 DESIGN AND CONSTRUCTION

The chassis shall have the gross vehicle weight of not less than 25000 kg including of equipments, crewmembers, etc. and shall have the following dimensions:

Wheelbase	: Approx. 5000 mm
Turning circle	: Not more than 20 m
Road clearance	: Not less than 230 mm
Over-all width	: Not more than 2.5 m
Height	: Approx 3.6 m from ground level

The chassis shall be 6x4 and the engine fitted on the chassis shall comply the respective emission norms in force at the time of delivery of chassis. The chassis shall be brand new with the following specifications.

Engine : 6 cylinders in-line water cooled, turbo charged, diesel inter cooled engine  
developing not less than 180 hp and conforming to prevalent emission norms

- Clutch : Single plate dry friction type hydraulically actuated.
- Gear Box : Synchromesh gearbox with crawler gear.
- Front Axle : Heavy duty, forged, 'I' beam.
- Rear Axle : single reduction, hypoid gears, fully floating axle shaft with tandem axle.
- Steering : Integral hydraulic power assisted steering
- Brakes : Dual circuit fully air braking system with pneumatically operated parking brakes  
on rear wheels.
- Suspension : Semi- elliptical leaf spring at front and rear with hydraulic double acting shock  
absorber on front.
- Frame : Ladder type heavy duty frame with riveted / bolted cross members.
- Wheels and Tyres: As per manufacturer's design– 11 Nos. (including spare wheel)
- Fuel Tank : Minimum 160 liters capacity.
- Electrical System: 12/24 volts. 120 Ah capacity battery with Alternator.
- Cowl : Standard cowl duly painted in RED color with instrument cluster, rear view mirrors, Wiper system original driver seat, safety belts.
- GVW : Not more than 25000 Kg
- Safety features: Anti Lock Breaking System (ABS)

### 2.9.3 ALTERNATOR UNIT

- A 230 / 440 V, 50 cycle alternator shall be provided which shall be driven by vehicle engine through a suitable PTO.
- The alternator shall be screen protected, continuously rated, self-regulating, self excited, class 'E' insulation type, having an output of not less than 25 KvA at 0.8 power factor, 220 / 440 V Three phase, 50 cycles.
- The alternator shall be equipped with a direct coupled flange mounted exciter which shall automatically keep the alternator voltage constant and provide an approximately straight line voltage characteristic within 5 percent at all loads, and at any pre-set factor between 0.8 and unity.
- Controls shall be mounted near the generator and shall consist of the following:
  1. Three sockets (plugs) and switches with 3 phase connections
  2. Four sockets (plugs) & switches (MCB's) with single phase connections of min. 15 AMP capacity
  3. Four sockets (plugs) & switches (MCB's) with single phase connections of min. 10 AMP capacity
  4. RPM Meter digital – 1 No.
  5. KW meter – 1 No.
  6. Ampere meter separate for each phase – Total – 3 Nos.
  7. Frequency meter – 1 No.
  8. 32 Amps. TPN MCB – 1 No.
  9. Hand throttle control;
  10. Automatic voltage regulator
  11. Pilot lamp indicating the phases

- Two cable reels each with 30 m of cable shall be provided for single-phase connections. The cable shall be a 3-core heavy duty flexible cords 250 V grade having a conductor of cross-section 4 mm (128/0.20 mm) conforming to IS 434(Part 1):1964 or IS 694:1977 along with necessary plugs and sockets.
- Two cable reels each with 20 m of cable shall be provided for Three phase connections. The cable shall be a 5-core heavy-duty flexible cords 440 V grade conforming to IS 434(Part 1):1964 or IS 694:1977 along with necessary plugs and sockets.
- An earthing rod with 3 meters long flexible earthing cable (flat type) shall be provided and should be placed in a closed box near the control panel.

#### **2.9.4 BODY WORK**

Enclosed accommodation for six persons shall be provided in the driver cab-cum-crew compartment including the driver and the in-charge of the crew. Both the seats should be independent. The driver's seat should be adjustable and comfortable. The rear compartment of driver's cabin should have one removable seat for full width of cab for 4 (four) crew members. The cab floor except the mudguard arches should be covered with 3 mm thick Aluminium chequered plate and the mudguard arches shall be covered with 1.22 mm thick aluminium chequered plates rigidly fixed to the under frame cross members by means of nuts and bolts or riveting. Trap doors for topping up oil etc wherever necessary shall be provided.

Two roof lights should be provided in the driver's cabin dwell vision and external rear view mirrors should be fitted to the cab.

The driver cum crew cabin shall be provided with full four doors, one for driver, one for officer and two at the crew compartment. The doors shall be generously sized for easy embarking / disembarking of crewmembers. All the doors shall be fitted on the super structural members, each hung upon three invisible coach type M.S. stout hinges and fitted with best quality handles.

The door handle on outside of driver seat shall have a locking arrangement. Other doors shall be lockable from inside. In addition to the doors locks, aluminum tower bolt of 8" shall be provided for all the doors from inside Adequate grab rails shall be provided for easily boarding and alighting from the appliance.

The windscreen glass shall be provided in the two valves and shall be semi curved in shape. Each glass shall be fitted in E.P.D.M. rubber beading. The glasses shall be 5 mm thick toughened safety glass. The rubber beading used for fitting glasses and window frame shall be E.P.D.M. rubber.

#### **2.9.5 SEATS**

The driver seat shall be adjustable type vertically, forward and backward. The officer seat shall be fixed type. Both the seats shall be rigidly fixed to the flooring by means of nuts and bolts.

The seat cushion shall be of latex foam rubber 75 mm thick upholstered in good quality foam leather cloth. The back seat shall be of latex foam rubber 50 mm thick upholstered in good quality foam leather cloth.

Below the crew seat, two lockers shall be provided. One for the batteries and another for keeping the accessories. The extra length of battery cable shall be provided if required.

The crew seat shall be rigidly fixed to floor by means of nuts and bolts, running full width of the vehicle suitable for sitting five firemen, covered with 75 mm x 50 mm cushion latex foam rubber upholstered in good quality foam leather of approved shade. Below the crew seat,

two lockers shall be provided, one for storage of batteries and another for keeping accessories. The extra length of battery cable shall be provided if required.

The structure/frame work shall be of welded constructions and made from 2mm thick MS pressed sections and square tubes. The Angles and channels used shall be of min. 3mm thickness. The complete structure material shall be treated for anti corrosion by Zinc Plating. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The structure shall be so designed to avoid any vibration / ratting / deformation in the intended usage of the vehicle.

The Under frame cross members shall be done from MS rolled channels of 100 x 50 x 5 mm (Min.) and the Floor angles shall be done from 50 x 50 x 6 mm. The interior paneling shall be done from 1.22mm thick aluminum sheets & the exterior paneling shall be done from 1.60mm thick aluminum sheets.

### 2.9.6 LOCKERS

The lockers should be provided for storage of all accessories. The lockers will have drawers as per the latest international standards i.e. roll in-roll out type with opening in tapered position giving very easy & immediate access to all equipments. All equipments should be stowed very scientifically & systematically in the drawers & each piece of equipment shall have its designated location so that at the time of EMERGENCY the required equipment can be very easily located & removed for use. Location of equipment (labels) should be provided on each drawer for immediate identification.

All the equipment should be properly clamped and strapped in the drawers to prevent shifting of the equipments while the vehicle is in motion. The drawer sides shall be constructed from aluminium angles of minimum 100mm X 4mm thickness and the bottom floor of the drawers will be made from min. 3 mm thick aluminium sheets and then covered with good quality neoprene rubber sheets.

The drawers should have self locking system to prevent accidental opening while the vehicle is in motion. The bottom edges of the drawers shall be covered with SS 304 angles of min 2 mm thickness. The roll-in-roll-out drawers should be made according to the required size suitable for the equipment that are to be stowed.

The lockers should be covered with Push-Pull type aluminium roller shutters only for faster & smoother rescue operation at the time of emergency.

The roller shutters shall be made from extruded aluminium sections with suitable roller, spring, guide channels etc. All aluminium sections used shall be properly anodized. The Roller shutters shall be rolled inwards underneath the roof giving unobstructed access to the equipment lockers and the firefighting material. These roller shutters should open in every position of the vehicle even in rough terrain. Guide rails shall support the shutters over entire length on both sides to make them absolutely torsion free.

The opening of the roller shutters should be done by means of a lift bar provided. This should be of the self-locking type so that while the vehicle is moving, the shutters do not open accidentally during movement of vehicle.

Roller shutters shall be made of hollow rectangular shaped aluminium links which shall be inter connected with rubber /plastic/ PVC profiles sealing the roller shutter watertight when closed. These roller shutters should be durable, maintenance free, weather and corrosion resistant.

All lockers shall be fitted with internal lighting which shall be capable of being automatically switched 'ON' and 'OFF' by the opening and closing of the roller shutters. A master switch for isolating the locker lighting circuit shall also be provided.

Grab-rails and non-slip steps be provided wherever necessary. A ladder made out of S.S. round or square pipe of 1" diameter shall be provided at the rear of the appliance to provide easy access to the roof of the vehicle.

### **2.9.7 CABLE WINCH**

An electrically operated cable winch of not less than 6.5 tons pulling capacity (single layer) shall be provided. The winch unit should be complete with minimum 5.5 hp, 12v or 24v DC series wound electric reversible motor for pulling operations. The motor and solenoids shall be grounded to the battery. It shall have an automatic load holding brake system for holding the load. For free spooling the clutch design shall be easy to use type with spring loaded pull and rotate system. The gear system should be 3 stage planetary type for faster line speed and the gear reduction ratio shall not be more than 300:1 for maximum duty cycle, the rope drum shall not be of more than 8 inches diameter and shall be supplied with minimum 90 ft heavy duty galvanized wire rope with replaceable self locking clevis hook and shall be mounted on the front bumper of the vehicle with suitable strong supports and a 4 way roller fairlead. Weather resistant clutch housing and solenoid assembly for maximum durability under any weather should be provided. Winch shall be provided with a wireless remote control mechanism for ease of operation.

### **2.9.8 TELESCOPIC LIGHT MAST**

A compact, low profile, roof mounted folding type, lighting mast, fitted with 4 X 1500 watts waterproof halogen lamps. The mast shall be elevated and vertically extended up to 4.5m pneumatically from the rooftop. The mast shall be installed on the roof of the vehicle at a suitable location.

The light mast shall operate in temperatures of -40 deg.C up to 60 deg C, with anti-twist lock, with safety valve and drainage outlet valve.

The mast will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>.

The telescopic mast should be extremely resistant and designed with a minimum of 4 sections and it will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>.

.Each section of the mast should have a water drainage outlet. The folded and stowed height should not be more than 1800mm. The Light mast will have Halogen flood light and reflectors in weatherproof casing. The floodlights on the top should have a minimum electrical rotation of 365° and a tilt of 310° Suitable connections for taking permanent Power Supply from generator set through an internal spiral wire mounted inside the mast should be provided.

A safety device must be added, by means of an infrared sensor that will stop the movement of the mast when tilting to the parking position in case any obstacle is detected on the way down.

All the functions of the mast, including extension and return to the original position, lights on/off, automatic restore should be capable of being done through a wired remote control. The same remote control must work without wire (wireless mode) through a male/female connector IP68 which keeps the battery under charge, whenever the remote is plugged and

there is tension on the power circuit. Every single input given by the user, no matter which, will be confirmed by a visual led and an additional led will confirm the battery status; every single group of 2 lights when switched on will have a corresponding led alight on the remote control that will go off only when the lights will be switched off. Every single input given by the user on the remote control will make the whole remote keyboard alight for not less than 15 seconds.

### **2.9.9 MISCELLANEOUS**

A suitable bumper shall be provided at the rear rigidly fixed to the super structural members by means of nuts and bolts which is supplied along with the chassis

Two folding ladders made out of S.S. round or square pipe of 1" diameter shall be provided at the rear of the vehicle to facilitate access to the rear deck.

2 numbers of 1" diameter aluminum pipe railing with sufficient number of aluminum double socket brackets shall be provided to the rear body over the deck.

A heavy-duty Towing hook shall be provided and fitted the rear bumper by means of nuts and bolts.

Quick removable type wire mesh guard made from 1" X 1" size MS wire mesh of 16 SWG covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin.

A 10.5 m aluminium Trussed type extension ladder shall be mounted on suitable gallows fitted with rollers and designed to facilitate easy and quick removal of the ladder from the rear of the appliance.

### **2.9.10 STABILITY**

The stability of the appliance shall be such that when under fully equipped and loaded conditions (but excluding crew). If the surface on which the appliance stands is tilted to either side, the point at which overturning occurs is not passed at an angle of  $27\frac{1}{2}^{\circ}$  from the horizontal.

### **2.9.11 WORKMANSHIP AND FINISH**

The standard of workmanship and finish of all mechanical and other parts shall be such that the parts normally required to be replaced can be supplied and will fit in correctly.

#### **2.9.11.1 Painting**

- The complete structure material shall be treated for anti corrosion by Zinc Plating. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.
- The complete external and internal aluminum paneling of driver cum crew cabin and rear body shall be painted with two coats of Zinc Chromate paint.
- The complete exterior of the vehicle shall be painted with two finish coats of "POST OFFICE RED" polyurethane paint manufactured by ICI Dulux / Nerolac / Dupont or similar brands.
- The internal painting of cabin lockers etc. shall be done with two coats of Grey Synthetic enamel paint made by ICI Dulux / Nerolac / Dupont or similar brands.
- The name of the fire service/organization shall be painted on both sides of vehicle in letter of suitable size in golden yellow paint with black color shading.
- The "EMBLEM" of the department shall be painted on both sides of vehicle in natural colors at suitable place.



## 2.9.12 INSTRUCTION BOOK AND ACCESSORIES

### 2.9.12.1 Instruction Book

Instruction book(s) for the guidance of the user, including both operating and normal maintenance procedures, shall be provided. The book(s) shall include an itemized and illustrated spare parts list, giving reference to all the wearing parts.

### 2.9.12.2 Accessories

The following accessories shall be provided in addition to these normally fitted on the chassis:

- Fog lamps - two, low mounted in front of appliance;
- Tools - All tools required for normal routine maintenance of the appliance, which are not included in the kit for the chassis;
- Search light - One, adjustable to give flood or beam light and shall be mounted in convenient position on the appliance but at the same time, shall be capable of being readily removed and mounted on tripods away from the appliance. It shall be supplied complete with tripod and not less than 30 m of TRS cable on reel mounted on the appliance;
- Spot light - two, adjustable and shall be mounted in convenient position on the roof of the appliance; and
- One, 12 /24 volts battery operated siren cum hooter cum public address system integrated with a light bar provided with revolving lights strobe type shall be mounted in a centre of the cabin on suitable brackets
- Quick removable type wire mesh guard made from 25x25mm size MS wire mesh of 1.60 mm covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin

## 2.9.13 MARKING

Each appliance shall be clearly and permanently marked with the following information:

- Manufacturer's name or trade-mark, if any; and
- Year of manufacture.

**Table 2-6: List of Accessories / Equipments to be carried on the Advanced Rescue Tender**

Sl.No.	Item	Quantity
1.	Breathing apparatus, open circuit positive pressure type with cylinder made of carbon composite material, having water capacity of 6 ltrs, 300 bar, 45 mnts duration, back plate, face mask, lung demand regulator, pressure reducer complete with harness with spare cylinder	6 sets
2.	Chemical Protective suits 'A' type	4 nos
3.	Chemical Protective suits 'B' type	4 nos
4.	NBC suit	2 nos



Sl.No.	Item	Quantity
5.	Fire entry suit	2 nos
6.	Fire proximity suits - The suit should be a two piece design (Jacket & Trouser) garment and should have an outer layer made of Inherent FR material followed by a Moisture Barrier and Thermal Liner (three layers minimum). It should have FR reflective tape on both garments for reflection in dark / smoky environment. Should be CE marked and certified to EN-469 standard. Should be supplied complete with a Multi Layer Fire Fighter Gloves CE marked and certified to EN659 standard; a Balclava Style Hood made of Inherent FR material – CE marked and certified to EN-13911 standard; A pair of Fire Fighter Gum Boots made of FR Rubber or Leather with pull-up loops, Steel Toe, Mid-Steel Sole. Boots should be CE marked and Certified to EN-345-2 standard; A Fire Fighter Helmet with visor and Neck Protector, CE marked and Certified to EN-443 standard.	2 nos
7.	Paratech rescue kit PRT	1 set
8.	Hazmat First Responder kit (HFR)	1 set
9.	Oxy-acetylene cutting set, complete with 5 l cylinders or equivalent and 10 m lengths of tubing, portable or trolley mounted	1 set
10.	Oxygen cylinder, spare	1
11.	Gauges for oxy-acetylene cutting plant, spare	1
12.	Leather gloves	2 pairs
13.	Goggles dark glasses	4 pairs
14.	Chain tackle 2 tons (Chain pulley block)	1 set
15.	Tarpaulin 12 ft X 12 ft	2 nos.
16.	Pulling and lifting machine, lifting 3 tonnes or pulling 5 tonnes and hook	1set
17.	Portable, electrically operated, circular saws, 220 – 250V, single phase min 2500 W, 4500 RPM, with Disc Diameter max - 300 mm [12"], Arbor size - 22.2 mm, Weight – not more than 12kg, With soft start technology built in within electronic control box, Diamond Tip Blade of 12" dia, 5000 RPM, Arbor size - 22.2 mm, Thickness - 3.5mm – 2 Nos and Composite Blade of 12" dia 5000 RPM, Arbor size - 22.2 mm, Thickness - 3.5mm with a set of 5 blades having capability of cutting various material such as Rails, Aircraft alloys, vehicle panels, metal roller doors, wooden frames, etc.	1 nos
18.	Portable, electric drill with different size drill bits from 1mm to 12 mm, single phase, 220 V with 3 mtrs long electrical cable with plug.	1 set
19.	Engineer's tools kit	1 set
20.	100 ft long 16 mm dia BOB rope	2 lengths
21.	40 ft long 12 mm dia BOB lashing lines	2 lengths
22.	20 ft long 10 mm dia BOB rope	1 length

Sl.No.	Item	Quantity
23.	100 ft long 5/8" dia wire rope	1 length
24.	Hardwood blocks, assorted, from 75 to 225 mm thick and 300 mm	6 nos
25.	Spades (see IS 2238:1979)	2 nos
26.	Shovel (see IS 274(Part 1 and 2):1981)	4 nos
27.	Mattocks, handle	2 nos
28.	Picks, with handle (see IS 273:1973)	6 nos
29.	Axes, felling (see IS 703:1966)	4 nos
30.	Crow bars, 1 m long (see IS 704:1968)	4 nos
31.	Sledge hammer 10 kg (see IS 841:1968)	2 nos
32.	Hammer, 5 kg (see IS 841:1968)	2 nos
33.	Rake, 3 prong (see IS 5991:1971)	2 no
34.	Rubber, gloves tested to 25,000 volts (see IS 4770:1968)	2 pair
35.	Shears, bolt cropper, large with handle, 900 mm	2 pair
36.	Shears, bolt cropper, small with handle 600 mm	2 pair
37.	Fire mans Axe with carrying pouch	2 nos
38.	Electric drill with spare bits Battery operated 2 mm to 10mm (rechargeable)	1 no.
39.	Circular saw with diamond blade, Power consumption - 1750 W Voltage - 230 V, RPM – 3400, Light in weight not more than 7.5kg Automatically adjustable blade guard, Required accessories and electrical cord of about 3 mtrs, Circular Saw Carbide Tip Blade, Dia - 235mm / Arbor - Compatible to circular saw suitable RPM - 5500 to 6000 / Thickness - 2 to 4mm – 2 Nos , Provision of expansion slot .	1 no.
40.	Chipping Hammer impact rate - 0-1400per/Min, Single impact force -38 -42 J min, Power input -1240 Watt, single phase 230 volts, Light in weight , shock proof body with required accessories, Less than weight 18 kg,With pointed and flat bit	1 no
41.	Smoke blower & exhauster Exhaust pipe - 300 mm dia, flexible of 5 meter long. Motor 0.75 HP 2200 RPM, single phase, 230 volt. It should work on both side one for throwing Air out & other is for sucking the Air in from out side. Flexible pipe should be foldable type with wire core made from abrasion resistant material. The close size 1 meter max. and the extended size shall not be less than 5 meter. preferable yellow or any other bright colour.	1 no.
42.	Electrically operated chain saw, Power consumption - 1600 W minimum, Voltage - 220 - 250 V, Amperage - 7 Amp [Approx], Guide Blade Length - Arm length - 18 inches minimum, Light weight, shock proof body, reservoir for lubricating for chain. With required accessories and electrical cord, Chain with 34/36 numbers of cutting tips. Compatible with chain saw of 18 inch. Guide bar, chain should be in closed ring	2 nos

Sl.No.	Item	Quantity																																										
	form – 2 Nos																																											
43.	Petrol engine operated chain saw, min. 94 CC, 2 stroke petrol driven IC engine, max. of load engine speed 9800 rpm +/- 300, 4.5 KW (6.1hp) power, min, Trigger, trigger lock and safety inter lock must be provided, Chain Saw with fast start segment design having min. 350mm deep cutting capacity., Fuel Tank Capacity – 1liter, Should be capable of cold manual pull cord start, Should be provided with choke arrangement, Cutting depth 390mm, Weight not more than 12 kg with chain & bar, Guide bar length 18" min, Chain of 32 segment, sealpro, with ELC 45 grade.with Spare Chain- 2 nos.	1 no.																																										
44.	Concrete Breaker having power input of not more than 1400 W, Impatc rate 42 joules, full load impact 1400 / min, bit shank size 30 mm hexagonal, weight not more than 17 kgs with accessories like carrying case, bull point and hexagn bar wrench m8 size.	1 no.																																										
45.	Petrol engine operated Portable generator 5 kva	1 no																																										
46.	<p>High pressure pneumatic lifting bags, working pressure 8 bar, made of Kevlar reinforced nitrile rubber with 3 layers aramide reinforcement, non slip design, Blue colour, capable of being interlocked when 2 bags are placed on top of each other, quick connection with automatic double locking system, centering cross on both sides, reflecting labels, CE-icons for safety insertion thickness not more than 25 mm including profile, resistant to ozone and range of chemicals etc of the following capacities :-</p> <table><tr><th>Lifting capacity</th><th>Min. Inflation height (mm)</th><th>Min dimensions (mm)</th><th>Weight (not more than) kg</th><th>Quantity</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10 tons</td><td>200</td><td>375 x 375</td><td>4</td><td>1 no</td></tr><tr><td>20 tons</td><td>275</td><td>500 X 500</td><td>7</td><td>1 no</td></tr><tr><td>40 tons</td><td>400</td><td>700 x 700</td><td>16</td><td>1 no</td></tr><tr><td>67 tons</td><td>500</td><td>900 x 900</td><td>25</td><td>1 no</td></tr></table> <p>The airbags are to be supplied with the following accessories</p> <table><tr><td>Pressure reducer 300 bar to 8 bar</td><td>2 nos</td></tr><tr><td>Control box for operating 2 airbags with pressure gauges ad carrying strap</td><td>2 nos.</td></tr><tr><td>Single control unit</td><td>4 nos</td></tr><tr><td>Air Hose 5 mtrs</td><td>2 nos</td></tr><tr><td>Air hose 10 mtrs</td><td>2 nos</td></tr><tr><td>Shut off hose with safety valve</td><td>4 nos</td></tr></table>	Lifting capacity	Min. Inflation height (mm)	Min dimensions (mm)	Weight (not more than) kg	Quantity						10 tons	200	375 x 375	4	1 no	20 tons	275	500 X 500	7	1 no	40 tons	400	700 x 700	16	1 no	67 tons	500	900 x 900	25	1 no	Pressure reducer 300 bar to 8 bar	2 nos	Control box for operating 2 airbags with pressure gauges ad carrying strap	2 nos.	Single control unit	4 nos	Air Hose 5 mtrs	2 nos	Air hose 10 mtrs	2 nos	Shut off hose with safety valve	4 nos	1 set
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Shut off hose with safety valve	4 nos																																											

Sl.No.	Item			Quantity																										
	Connection piece to connect two air cylinders	2 nos																												
47.	<p>Jumping Air cushions type as per specs given below</p> <p>The jumping rescue cushions should have high reliability and shall be easy to handle and shall be capable of being fully erected by 4 to 6 persons. The possible jumping height shall not be less than 30 mtrs. It shall have illumination for night operations and shall be capable of being used in dusty conditions. The detailed technical specifications are as under:-</p> <table><tr><td>Shape</td><td>8 corner shape (octagonal)</td></tr><tr><td>Outer Dimensions</td><td>Not less than 5.50 X 5.50 mtrs</td></tr><tr><td>Usable jumping area</td><td>Not Less than 4.50 X 4.50 mtrs</td></tr><tr><td>Jumping angle (30m height)</td><td>9.74°</td></tr><tr><td>Tube diameter of the inflatable frame</td><td>22 cm ( 0,22 meters)</td></tr><tr><td>Material of frame</td><td>Natural rubber reinforced with polyester fabric 940 dtex, black</td></tr><tr><td>Material of outer cover</td><td>Fire retardant special PVC-coated polyester fabric, orange</td></tr><tr><td>Material of jumping area</td><td>Fire retardant special PVC-coated polyester fabric, white with black markings</td></tr><tr><td>Compressed air cylinders</td><td>2 x 6l/300bar or equivalent steel cylinders</td></tr><tr><td>Erection time</td><td>Not more than 75 sec. (depending on the used cylinders)</td></tr><tr><td>Re-erection after a jump</td><td>Not more than 10 sec.</td></tr><tr><td>Weight of the complete device (with charged cylinders)</td><td>Not more than 150 kg</td></tr><tr><td>Packing</td><td>It Shall be packed in a valise with handles for 6 persons</td></tr></table>			Shape	8 corner shape (octagonal)	Outer Dimensions	Not less than 5.50 X 5.50 mtrs	Usable jumping area	Not Less than 4.50 X 4.50 mtrs	Jumping angle (30m height)	9.74°	Tube diameter of the inflatable frame	22 cm ( 0,22 meters)	Material of frame	Natural rubber reinforced with polyester fabric 940 dtex, black	Material of outer cover	Fire retardant special PVC-coated polyester fabric, orange	Material of jumping area	Fire retardant special PVC-coated polyester fabric, white with black markings	Compressed air cylinders	2 x 6l/300bar or equivalent steel cylinders	Erection time	Not more than 75 sec. (depending on the used cylinders)	Re-erection after a jump	Not more than 10 sec.	Weight of the complete device (with charged cylinders)	Not more than 150 kg	Packing	It Shall be packed in a valise with handles for 6 persons	1 no.
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48.	Leak sealing bags			1 set																										
49.	<p>Hydraulic Spreader as per the following specs</p> <p>Spreading force on the open arm - not less than 32 Tons,</p> <p>Spreading distance – not less than 675 mm,</p> <p>Spreading force arm closed – not less than 4 Ton (measured at 25mm from the tips),</p>			1 no																										

Sl.No.	Item	Quantity
	<p>Squeezing force – not less than 6 Ton,            Pulling distance – not less than 440mm,            Pulling force – not less than 8 Ton.            Weight approx 18 kgs,            Working temp. range -20 +80 deg.</p> <p>It should have well serrated tips for perfect grip during spreading &amp; squeezing, sharp cutting tips with optimal angle, Slim arms &amp; Yoke design for easy penetration in confined spaces, accurate spring return to neutral position, maximum rotation to the right &amp; to the left only 22 degree, built in double check valves, full protection against overload with all accessories like pulling chains, chain adaptors with a maintenance kit. The carrying handle should preferably have integrated lighting. The equipment &amp; accessories should be new, unused &amp; should conform to latest design &amp; specifications. The tool should have only 1 quick coupler directly connected to the tool without hoses</p>	
50.	<p>Hydraulic Cutter as per the following specs</p> <p>Cutting force in the recess – not less than 100 Ton</p> <p>Capable of cutting round bar - not less than 40mm dia steel rod of 500 – 550 mpa strength</p> <p>Blade opening - not less than 200 mm</p> <p>The dead mans handle should have accurate spring return to neutral position, maximum rotation to the right and to the left only 22 degree, built in double check valves, full protection against overload. The tool should preferably have slim bolt design for easy penetration in confined places and the carrying handle should preferably have integrated lighting. The maintenance kit should have spare blade, tool kit to change the blade etc. The tool should have only 1 quick coupler directly connected to the tool without hoses</p>	2 nos
51.	<p>Hydraulic Combi Tools as per the following specs</p> <p>Spreading force on the open arm - not less than 20 Ton</p> <p>Spreading distance - not less than 350mm</p> <p>Spreading force arm closed - not less than 3.5 Ton measured 25 mm from the tips,            Squeezing force - not less than 7.5 Ton</p> <p>Pulling length - not less than 400 mm,            Pulling force - not less than 5 Ton,            Maximum cutting force in recess - not less than 35 ton</p> <p>Cutting opening - not less than 225 mm,            Capable of cutting round bar - not less than 32 mm dia.</p> <p>Weight approx 15 kgs,</p> <p>It should have well serrated tips for perfect grip during spreading &amp; squeezing, sharp cutting tips with optimal angle. The tool should preferably have Slim arms, Yoke &amp; slim bolt design for easy penetration in confined places and the carrying handle should preferably have integrated lighting, accurate spring return to neutral position, maximum rotation to the right and to the left only 22 degree, built in double check valves, full protection against overload with all accessories like pulling chains, chain adaptors, with a maintenance kit. The equipment &amp; accessories should be</p>	2 nos

Sl.No.	Item	Quantity
	new, unused and should conform to latest design and specifications. The tool should have only 1 quick coupler directly connected to the tool without hoses	
52.	<p>Hydraulic Telescopic Ram as per the following specs</p> <p>Spreading force of 1st plunger – not less than 20 Ton</p> <p>Spreading force of 2nd plunger - not less than 8 Ton,</p> <p>Length retracted including cross head – less than 600 mm</p> <p>Total Length including cross head – not more than 1300 mm,</p> <p>Stroke of 1st plunger - not less than 375 mm</p> <p>Stroke of 2nd plunger - not less than 350 mm</p> <p>It should have rotating cross head for easy positioning &amp; perfect grip in every positioning, accurate spring return to neutral position, maximum rotation to the right and to the left only 22 degree, full protection against overload, with all accessories like maintenance kit. The equipment &amp; accessories should be new, unused and should conform to latest design and specifications. The tool should have only 1 quick coupler directly connected to the tool without hoses</p>	1 no.
53.	<p>Rescue Ram as per the following specifications :-</p> <p>Minimum spreading force - 16 Ton,</p> <p>Minimum length retracted including cross head – less than 1000 mm,</p> <p>Maximum length including cross head - less than 1750 mm</p> <p>Pulling force not less than – 5 tons,</p> <p>Stroke - min 2 X 325 mm,</p> <p>No. of Plungers – 2</p> <p>It should have rotating cross head for easy positioning &amp; perfect grip in every positioning, accurate spring return to neutral position, maximum rotation to the right and to the left only 22 degree, full protection against overload, with all accessories like a maintenance kit. The equipment &amp; accessories should be new, unused and should conform to latest design and specifications. . The tool should have only 1 quick coupler directly connected to the tool without hoses</p>	1 set.
54.	<p>Hydraulic light weight aluminium jack as per the following specifications :-</p> <p>Lifting Capacity - Not less than 50 tons</p> <p>Closed Height - Approx 150 mm</p> <p>Stroke - Approx 50 mm</p> <p>Weight - Not more than 7.5 kg</p>	1 no
55.	<p>Hydraulic light weight aluminium jack as per the following specifications :-</p> <p>Lifting Capacity - Not less than 50 tons</p> <p>Closed Height - Approx 200 mm</p> <p>Stroke - Approx 100 mm</p> <p>Weight - Not more than 9.5 kg</p>	1 no
56.	Hydraulic TOE jack with accessories - It should be Single acting hydraulic tool suitable for lifting heavy vehicles; trams or machines to free victims or objects that	1 no

Sl.No.	Item	Quantity
	are trapped after an accident. Max. centric force on the saddle : not less than 11 tons Max. force on toe : not less than 9 tons Closed height : not less than 440 mm Extended height : not less than 685 mm Weight : not more than 21 kg	
57.	Hydraulic door opener complete with a 2 stage hand pump. The spreading force shall not be less than 9 tons and the stroke shall not be less than 125 mm. A swiveling type connection with 30 cm long hose shall be provided.	1 no
58.	Hydraulic Pedal cutter shall have straight blades, one fixed and one moving, with a cutting force of at least 75 kN (7.7 ton). It shall be suitable to cut metal parts like car pedals, steering wheels, seat frames etc The opening in the jaw shall be at least 40 mm, whilst the width of the jaw shall be no more than 40 mm to use the cutter in confined spaces. It shall have a 360° rotation elbow, 30 cm pigtail hose and quick coupler	1 no
59.	Hydraulic pump for 2 tools simultaneous operation with 15 mtrs long hose as per the following specifications :- Engine - Petrol engine Capacity oil tank (effective / usable) - Not less than 3.6 litres Pump type - 2 stage radial pump Weight - Not more than 25 kgs No. of tools connected - Two No. of tools to be operated simultaneously – Two	2 no
60.	Hydraulic foot / hand operated pump mounted on suitable base plate with 10 mtrs long hose. The pump shall have two-stage operation and shall be capable of developing adequate pressure for operating all the tools including the telescopic ram upto their full capacity	1 no
61.	Coaxial hose having pressure line inside the return line for use with the hydraulic tools 10 mtrs long orange and blue color – 1 each	2 nos
62.	Hose reel with 25 mtrs long high pressure coaxial hose having pressure line inside the return line for use with the hydraulic tools	1 no.
63.	Power Shoring system comprising of the following :- 1 no. Strut with air cylinder retracted length not less than 625mm 1 no. Strut with air cylinder retracted length not less than 1000mm 1 no. Strut with Hydraulic cylinder retracted length not less than 625mm 1 no. Strut with Hydraulic cylinder retracted length not less than 1000mm 1 nos. Mechanical strut retracted length not less than 225mm 1 nos. Mechanical strut retracted length not less than 550mm	1 set



Sl.No.	Item	Quantity
	2 nos. Hand Pump for operating struts with hydraulic cylinders 8 nos. Extension pipe 125mm 8 nos. Extension pipe 250mm 6 nos. Extension pipe 500mm 6 nos. Extension pipe 1000mm 4 nos. Connector 4 nos. Saddle with round surface 2 nos. Saddle with flat plate 4 nos. Tilting saddle 2 nos. Tilting saddle with steel plate 2 nos. beam support 150mm 4 nos. L support 4 nos. Swivel head 1 no. V block 1 no. V block large 2 nos. Cone head 2 nos. Cross head 2 nos. Support plate 2 nos. Tensioning belt 2 nos. Adjustable Hook Wrench Accessories for Struts with Air cylinder 2 nos. Double control unit 2 nos. Pressure reducer 2 nos. hose 5 Mtrs. Each 2 nos. hose 10 Mtrs. each.	
64.	Glass breaker (window punch)	1 no
65.	Evacuation system (rope rescue with tripod and descenders etc) consisting of a Tripod with rope rescue modular evacuation device ratio 3:1. The weight of the Tripod should not be more than 15 kgs and should have 4 point SS anchoring system on the top with Aluminium die cast locking system. All the three sides of the tripod should allow entry of the person without obstacles like chain etc. The load carrying capacity shall be 500 kg and the breaking strength of 1000daN. Their shall be 8 adjustable index positioning. A harness shall be provided consisting of 1 Dorsal attachment D ring / 1 Rescue D ring (rear), 2 Lateral attachment D rings, Positioning belt, Fully adjustable shoulder and thigh straps, net weight 1.6 Kg., and Rescue strap with hooks for 2 <sup>nd</sup> person. It shall also have a ascending / descending device of 100 operating range with 400 mtrs braided rope of polyamide material of 9 mm dia. The braking of descending load shall be by the friction of the rope on the drum, while a ratchet gear facilitates ascension Control and Descent Speed. The Permissible Load shall e 250 Kg with pulley reduction ratio of 3:1 The weight of this unit shall not be more than 1.75 kg. A ascending and locking handle made of light alloy shall also be provided with special gear belt for rope rescue and	1 set

Sl.No.	Item	Quantity
	<p>sit harness.</p> <p>A descent control device for mass evacuation from high rise buildings and public places consisting of 32 mtrs. Descent controller with all the accessories The features should include Automatic cable rewind, Self control speed of 1.20 per sec., Equipped with centrifugal brake, Load carrying capacity 150 kg. Metallic casing dully painted and shall have stainless steel cable of 5 mm dia and rescue strap. The weight of the unit shall be about 22 kg</p>	
66.	<p>Search Camera - The systems primary configuration should be based on a video camera built at one end of a telescopic boom which can reach out into depths and void spaces up to a distance of 2m. This boom shall be extended telescopically and shall have 4 sections giving a total length of 2m and shall be fitted with minimum 5m of cable. Provision should also be made to manually lock the telescopic boom at the distance required.</p> <p>The video camera shall have a colour display with a sensitivity of 0.5 lux and shall have 6 white LED lights which will allow visibility in pitch black conditions to a distance of 4 m. The camera head shall be able to rotate 360° without stop (infinitely). A speaker and a microphone shall be built into the body of the video camera, which will allow communication with the trapped person through a head-set.</p> <p>The system shall have a control box for the operator which will be fitted with a minimum 7-inch, LCD colour screen, TFT active matrix, and shall be stored in a leather protective case with adjustable shoulder strap.</p> <p>The system shall also be provided with mono headphones fitted with dynamic microphone with anti-disconnection plug which will allow the operator to communicate with the victims via the speaker and microphone built in the video camera. The cable length shall be minimum 1.5 mtrs</p> <p>There should be provision for attachment of an additional headset for use by a third person like an interpreter or a doctor etc</p> <p>The system design shall be such that it would not require more than 2 persons to operate, one operator to handle the probe, and the second for the control box: of the probe to see and search through the screen, communicate with victims.</p> <p>The system shall have an inbuilt battery, 12V - 4.5 Ah battery, Ni-MH technology with an intelligent charger. The battery shall allow minimum 4.5 hours of continuous usage of the system and should be able to be fully charged in 4 hours. The system shall be equipped with an audible alarm which will warn the operator when the battery is low. A suitable Cigar-lighter adapter shall be provided to enable the charge the battery in a vehicle if necessary</p> <p>An additional water proof camera capable of being used at a depth of 60 mtrs with 60 mtrs cable mounted on reel shall be provided. The camera shall be IP 67 compliant and shall give colour display. The camera should rotate 360 deg. and shall have integrated LED lights. Speaker and microphone shall be integrated in the body of the camera</p> <p>The system shall be capable of being operated in temperature range -10° to +60°C</p>	1 no
67.	<p>Life detector - The Life Detector should be a hand held instrument designed to quickly locate Living Human Beings from behind barriers – trapped under debris of structural collapse, from buildings in smoke or even stuck under water by detecting electric field generated by human heart or any other human property. The instrument should be able to detect living human beings from far off distances as long as at least 350~400 m in open air and at least from 150~200 m when behind barriers (any type of barrier including multiple layers of concrete slabs, debris, steel</p>	1 no

Sl.No.	Item	Quantity
	structures, mud-landslide, snow-avalanche, under water etc. The instrument should not need any power supply so that it can be used in disaster emergencies. The life detector should not detect any animals or creatures and should be such that its performance should not be affected by presence of other machinery / instruments	
68.	<p>Acoustic based victim location unit - The equipment is an acoustic listening device, light weight and easy to carry. Designed especially to detect and locate trapped, live victims in collapsed structure caused by earthquake, explosions, landslides, construction cave-ins or mine disasters. The slightest noise the victim makes should be detected by this device and so the sensitivity is exceptional. It is fitted with an adjustable filter to deaden the effect of dull noises like pneumatic drills, lorries passing...</p> <p><u>Capabilities required:</u></p> <ul style="list-style-type: none"> <li>• <b>Housing/Amplifiers &amp; filters:</b> IP66 housing with bar-graph for adjustment with IP 68 connectors.</li> </ul> <p>Two very high gain, low noise amplifiers.</p> <p>Two frequency filters "high pass and band pass" infinitely variable, filters activated by 2 keys (the chosen frequency is infinitely variable using the + and - keys)</p> <p>Filter 1: High pass filter" significantly reduces all frequencies below its adjustment point, which may be between 50Hz and 5 kHz which correspond respectively to the low and the high points on the liquid crystal scale. It will eliminate bass sounds such as lorry movements, dull noises...</p> <p>Filter 2: "Band pass filter" significantly reduces low and high frequencies on either side of its turning point. It will filter an incoming signal.</p> <ul style="list-style-type: none"> <li>• <b>Sensors:</b> Two ultra-high sensitivity black vibration sensors with 8m of cable - One sound sensor fitted with a microphone and a loud speaker with 8m of cable.</li> <li>• <b>Headset:</b> One stereo head-set with microphone</li> <li>• <b>Batteries:</b> One pack of 6 rechargeable Ni/Mh batteries type LR6/AA (operating life 30h)</li> </ul> <p>One accumulator charger (usable at 50/60Hz 100v to 240v)</p> <p>One cigarette lighter charger plug with wire to be use in a vehicle.</p> <ul style="list-style-type: none"> <li>• <b>Specifications:</b> Operating temperature: -10° to +60°C</li> </ul> <p>Storage temperature: -25°to +70°C</p> <p>Total weight: 2kg (in use) / 8 kg (with carrying case)</p> <ul style="list-style-type: none"> <li>• Carrying case: One carrying strap and one shock proof carrying case</li> </ul>	
69.	Loud hailer battery operated	1 no
70.	Inflatable lighting tower with inbuilt 4 stroke petrol engine driven generator of 1200 VA with 400 watts high pressure Metal halide lamp, inflatable height of 4 mtrs with 2 blowers for balloon inflation. It should be possible to use the unit through AC mains. Weight not more than 45 kg	1 no
71.	Pipe wrenches 12" & 24"	1 each
72.	Wrench adjustable 12"	1 no
73.	Slotted screw drivers	1 set

Sl.No.	Item	Quantity
74.	Orange paint can	1 no
75.	Plywood (Marine grade) 1.25 m X 2.5 m	1 no
76.	Wood wedges	4 nos
77.	Search light (Rechargeable)	2 nos
78.	Inflatable boat for 7 persons with OBM. The inflatable boat should be made of DERNIER 1000 material, 19" tube dia. The exterior size approx 4200mm X 1800 mm and the interior size should be approx. 2925 mm X 1000 mm. The boat should have max 4 chambers including min. 7" inflatable keel. It should have interlocking type polyurethane floor boards. The Weight of the Boat should not be more than 90 kgs .The OBM should have 25 hp 4 stroke above 500 cc engine complete with power trim, electric start and quick detachable tubular type steering system and remote control facility	1 no
79.	BA compressor 100 LPM - The Compressor should be a 3 or 4 stage air cooled high pressure compressor for filling SCBA or SCUBA cylinders at a pressure of 200 or 300 bar with switch-over device for the same. It should have capacity / FAD of 100 lpm for standard filling norm and should come with two hoses – one each for 200 and 300 bar. The compressor should be light weight, portable design, driven by a Petrol Engine so that it can be used on disaster sites without power supply also. Air quality should be as per DIN 3188 / CGA-E / EN12021 and should have been tested by one International and one Indian Laboratory. The compressor should be supplied with one spare filter cartridge. Weight should be less than 50 kg	1 no
80.	Thermal Imaging Camera capable of seeing thru zero visibility conditions/ darkness suitable for firefighting and rescue applications. The Thermal Camera should be of latest technology with advanced features such as capability of viewing in at least 4 different color modes, working in zoom mode as well as the capability of capturing / storing thermal images, which can be downloaded on computer for subsequent report preparation. The thermal camera should be lightweight weighing less than 1.50 kgs and the Camera should have provision of showing both the ambient temperature as well as spot/ direct temperature measurements. The Camera should be supplied complete with accessories such as remote control, software , rechargeable battery pack & user manual	1 no.
81.	Rescue rocket system with sling and line deployment consisting of one launcher, inflatable sling and line projectiles with charging hose & adaptor with 300 ft polypropylene rope and 500 ft Decron 3 mm rope with rope storage compartment to be used with the launcher along with accessories. The system should be intrinsically safe and should work on Air Thrust technology.	1 no.

## 2.10 Light Emergency Rescue Tender

Approximate Cost: Rs. 50 Lakhs.

The small emergency rescue tender would be fabricated on light commercial vehicle chassis supplied with factory built cabin. The chassis should be able to take the payload of not less than 8 tons.

### 2.10.1 BODY WORK

The rear body structure/frame work shall be of welded constructions and made from 2mm thick MS pressed sections and square tubes. The Angles and channels used shall be of min. 3mm thickness. The complete structure material shall be treated for anti corrosion by ZINC PLATING. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The structure shall be so designed so as to avoid any vibration / ratting / deformation in the intended usage of the vehicle.

The Under frame cross members shall be done from MS rolled channels of 100 x 50 x 5 mm (Min.) and the Floor angles shall be done from 50 x 50 x 6 mm

The interior paneling shall be done from 1.22mm thick aluminum sheets & the exterior paneling shall be done from 1.60mm thick aluminum sheets.

#### 2.10.1.1 Lockers

The lockers should be provided for storage of all equipments mentioned in the below specifications. The lockers will have drawers as per the latest international standards i.e. roll in-roll out type with opening in tapered position giving very easy & immediate access to all equipments. All equipments should be stowed very scientifically & systematically in the drawers & each piece of equipment shall have its designated location so that at the time of emergency the required equipment can be very easily located & removed for use. Location of equipment (labels) should be provided on each drawer for immediate identification.

All the equipment should be properly clamped and strapped in the drawers to prevent shifting of the equipments while the vehicle is in motion.

The drawer sides shall be constructed from aluminum angles of minimum 100mm X 4mm thickness and the bottom floor of the drawers will be made from min. 3 mm thick aluminum sheets and then covered with good quality neoprene rubber sheets.

The drawers should have self locking system to prevent accidental opening while the vehicle is in motion. The bottom edges of the drawers shall be covered with SS 304 angles of min 2 mm thickness. The Roll in-Roll out drawers should be made according to the required size suitable for the equipment that are to be stowed.

The lockers should be covered with Push-Pull type aluminum roller shutters only for faster & smoother rescue operation at the time of emergency.

The roller shutters shall be made from extruded aluminum sections with suitable roller, spring, guide channels etc. All aluminum sections used shall be properly anodized.

The Roller shutters shall be rolled inwards underneath the roof giving unobstructed access to the equipment lockers and the firefighting material.

These roller shutters should open in every position of the vehicle even in rough terrain. Guide rails shall support the shutters over entire length on both sides to make them absolutely torsion free.

The opening of the roller shutters should be done by means of a lift bar provided. This should be of the self locking type so that while the vehicle is moving, the shutters do not open accidentally during movement of vehicle..

Roller shutters shall be made of hollow rectangular shaped aluminum links which shall be inter connected with rubber /plastic/ PVC profiles sealing the roller shutter watertight when closed. These roller shutters should be durable, maintenance free, weather and corrosion resistant.

All lockers shall be fitted with internal lighting which shall be capable of being automatically switched 'ON' and 'OFF' by the opening and closing of the roller shutters. A master switch for isolating the locker lighting circuit shall also be provided.

Grab-rails and non-slip steps be provided wherever necessary. A ladder made out of S.S. round or square pipe of 1" diameter shall be provided at the rear of the appliance to provide easy access to the roof of the vehicle.

### **2.10.2 ALTERNATOR UNIT**

A 230 / 440 V, 50 cycle alternator shall be provided which shall be driven by vehicle engine through a suitable PTO.

The alternator shall be screen protected, continuously rated, self-regulating, self excited, class 'E' insulation type, having an output of not less than 15 KVA at 0.8 power factor, 220 / 440 V Three phase, 50 cycles.

The alternator shall be equipped with a direct coupled flange mounted exciter which shall automatically keep the alternator voltage constant and provide an approximately straight line voltage characteristic within 5 percent at all loads, and at any pre-set factor between 0.8 and unity.

Controls shall be mounted near the generator and shall consist of the following:

- Three sockets (plugs) and switches with 3 phase connections
- Four sockets (plugs) & switches (MCB's) with single phase connections of min. 15 AMP capacity
- Four sockets (plugs) & switches (MCB's) with single phase connections of min. 10 AMP capacity
- RPM Meter digital – 1 No.
- KW meter – 1 No.
- Ampere meter separate for each phase – Total – 3 Nos.
- Frequency meter – 1 No.
- 32 Amps. TPN MCB – 1 No.
- Hand throttle control;
- Automatic voltage regulator
- Pilot lamp indicating the phases

Two cable reels each with 30 m of cable shall be provided for single phase connections. The cable shall be a 3-core heavy duty flexible cords 250 V grade having a conductor of cross-section 4 mm (128/0.20 mm) conforming to IS 434(Part 1):1964 or IS 694:1977 along with necessary plugs and sockets.



Two cable reels each with 20 m of cable shall be provided for three phase connections. The cable shall be a 5-core heavy duty flexible cords 440 V grade conforming to IS 434(Part 1):1964 or IS 694:1977 along with necessary plugs and sockets.

An earthing rod with 3 meters long flexible earthing cable (flat type) shall be provided and should be placed in a closed box near the control panel.

### **2.10.3 CABLE WINCH**

An electrically operated cable winch of not less than 6.5 tons pulling capacity (single layer) shall be provided. The winch unit should be complete with minimum 5.5 hp, 12v or 24v DC series wound electric reversible motor for pulling operations. The motor and solenoids shall be grounded to the battery. It shall have an automatic load holding brake system for holding the load. For free spooling the clutch design shall be easy to use type with spring loaded pull and rotate system. The gear system should be 3 stage planetary type for faster line speed and the gear reduction ratio shall not be more than 300:1 for maximum duty cycle, the rope drum shall not be of more than 8 inches diameter and shall be supplied with minimum 90 ft heavy duty galvanized wire rope with replaceable self locking clevis hook and shall be mounted on the front bumper of the vehicle with suitable strong supports and a 4 way roller fairlead. Weather resistant clutch housing and solenoid assembly for maximum durability under any weather should be provided. Winch shall be provided with a wireless remote control mechanism for ease of operation.

### **2.10.4 TELESCOPIC LIGHT MAST**

A compact, low profile, roof mounted folding type, lighting mast of Fireco or Will Burt or similar make, fitted with 4 X 1500 watts water proof halogen lamps. The mast shall be elevated and vertically extended up to 4.5m pneumatically from the roof top. The mast shall be installed on the roof of the vehicle at a suitable location.

The light mast shall operate in temperatures of -40° C up to 60° C, with anti-twist lock, with safety valve and drainage outlet valve.

The mast will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>.

The telescopic mast should be extremely resistant and designed with a minimum of 4 sections and it will be equipped with an internal spiraled electrical cable with 9 wires with a section each of 1.5 mm<sup>2</sup> and 13 wires with a section each of 0.22 mm<sup>2</sup>, the group of 13 wires will be screened. Each section of the mast should have a thickness of not less than 3.5 mm<sup>2</sup>.

.Each section of the mast should have a water drainage outlet. The folded and stowed height should not be more than 1800mm. The Light mast will have Halogen flood light and reflectors in weatherproof casing. The floodlights on the top should have a minimum electrical rotation of 365° and a tilt of 310° Suitable connections for taking permanent Power Supply from generator set through an internal spiral wire mounted inside the mast should be provided.

A safety device must be added, by means of an infrared sensor, that will stop the movement of the mast when tilting to the parking position in case any obstacle is detected on the way down.

All the functions of the mast, including extension and return to the original position, lights on/off, automatic restore should be capable of being done through a wired remote control. The same remote control must work without wire (wireless mode) through a male/female connector IP68 which keeps the battery under charge, whenever the remote is plugged and there is tension on the power circuit. Every single input given by the user, no matter which,



will be confirmed by a visual led and an additional led will confirm the battery status; every single group of 2 lights when switched on will have a corresponding led alight on the remote control that will go off only when the lights will be switched off. Every single input given by the user on the remote control will make the whole remote keyboard alight for not less than 15 seconds.

### **2.10.5 MISCELLANEOUS**

A suitable bumper shall be provided at the rear rigidly fixed to the super structural members by means of nuts and bolts which is supplied along with the chassis

Two folding ladders made out of S.S. round or square pipe of 1" diameter shall be provided at the rear of the vehicle to facilitate access to the rear deck..

2 nos of 1" dia aluminum pipe railing with sufficient number of aluminum double socket brackets shall be provided to the rear body over the deck.

A heavy duty Towing hook shall be provided and fitted the rear bumper by means of nuts and bolts.

Quick removable type wire mesh guard made from 1" X 1" size MS wire mesh of 16 SWG covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin.

A 7.5 m aluminum TRUSSED TYPE extension ladder shall be mounted on suitable gallows fitted with rollers and designed to facilitate easy and quick removal of the ladder from the rear of the appliance.

#### **2.10.5.1 Stability**

The stability of the appliance shall be such that when under fully equipped and loaded conditions (but excluding crew). If the surface on which the appliance stands is tilted to either side, the point at which overturning occurs is not passed at an angle of  $27\frac{1}{2}^{\circ}$  from the horizontal.

### **2.10.6 WORKMANSHIP AND FINISH**

The standard of workmanship and finish of all mechanical and other parts shall be such that the parts normally required to be replaced can be supplied and will fit in correctly.

#### **2.10.6.1 Paint**

The complete structure material shall be treated for anti corrosion by Zinc Plating. The plating thickness shall not be less than 20 microns. Two coats of Epoxy paint shall be applied to the completely welded structure.

The complete external and internal aluminum paneling of driver cum crew cabin and rear body shall be painted with two coats of Zinc Chromate paint.

The complete exterior of the vehicle shall be painted with two finish coats of "POST OFFICE RED" polyurethane paint manufactured by ICI Dulux / Nerolac / Dupont or similar manufacturer brand.

The internal painting of lockers etc. shall be done with two coats of Grey Synthetic enamel paint made by ICI Dulux / Nerolac / Dupont.

The name of the fire service/organization shall be painted on both sides of vehicle in letter of suitable size in golden yellow paint with black color shading.

The "EMBLEM" of the department shall be painted on both sides of vehicle in natural colors at suitable place.

## 2.10.7 INSTRUCTION BOOK AND ACCESSORIES

### 2.10.7.1 Instruction Book

Instruction book(s) for the guidance of the user, including both operating and normal maintenance procedures, shall be provided. The book(s) shall include an itemized and illustrated spare parts list, giving reference to all the wearing parts.

### 2.10.7.2 Accessories

The following accessories shall be provided in addition to these normally fitted on the chassis:

- Fog lamps - two, low mounted in front of appliance;
- Tools - All tools required for normal routine maintenance of the appliance, which are not included in the kit for the chassis;
- Search light - One, adjustable to give flood or beam light and shall be mounted in convenient position on the appliance but at the same time, shall be capable of being readily removed and mounted on tripods away from the appliance. It shall be supplied complete with tripod and not less than 30 m of TRS cable on reel mounted on the appliance;
- Spot light - two, adjustable and shall be mounted in convenient position on the roof of the appliance; and
- One, 12 /24 volts battery operated siren cum hooter cum public address system integrated with a light bar provided with revolving lights strobe type shall be mounted in a centre of the cabin on suitable brackets
- Quick removable type wire mesh guard made from 25x25mm size MS wire mesh of 1.60 mm covered in MS angle frame shall be provided to all the glasses of driver-cum-crew cabin

## 2.10.8 MARKING

Each appliance shall be clearly and permanently marked with the following information:

- Manufacturer's name or trade-mark, if any; and
- Year of manufacture.

**Table 2-7: List of Accessories / Equipments to be carried on the Light Advanced Rescue Tender**

Sl.No.	Item	Quantity
1)	Breathing apparatus, open circuit positive pressure type with cylinder made of carbon composite material, having water capacity of 6 ltrs, 300 bar, 45 mtrs duration, back plate, face mask, lung demand regulator, pressure reducer complete with harness conforming to EN 137-2006 part 2 with spare cylinder	2 sets
2)	Portable, electrically operated, circular saws, 220 – 250V, single phase min 2500 W, 4500 RPM, with Disc Diameter max - 300 mm [12"], Arbor size - 22.2 mm, Weight – not more than 12kg, With soft start technology built in within electronic control box, Diamond Tip Blade of 12" diameter, 5000 RPM, Arbor size - 22.2 mm, Thickness - 3.5mm – 2 Nos and Composite Blade of 12" diameter 5000 RPM, Arbor size - 22.2 mm, Thickness - 3.5mm with a set of 5 blades having capability of cutting various material such as Rails, Aircraft alloys, vehicle panels, metal roller doors, wooden frames, etc.	1 nos

Sl.No.	Item	Quantity																									
3)	100 ft long 16 mm diameter BOB rope	2 lengths																									
4)	40 ft long 12 mm diameter BOB lashing lines	2 lengths																									
5)	Spades (see IS 2238:1979)	1 no																									
6)	Shovel (see IS 274(Part 1 and 2):1981)	1 nos																									
7)	Picks, with handle (see IS 273:1973)	1 nos																									
8)	Axes, felling (see IS 703:1966)	1 nos																									
9)	Crow bars, 1 m long (see IS 704:1968)	1 nos																									
10)	Sledge hammer 10 kg (see IS 841:1968)	1 nos																									
11)	Rubber, gloves tested to 5,000 volts (see IS 4770:1968)	2 pair																									
12)	Shears, bolt cropper, large with handle, 900 mm	1 no																									
13)	Fire mans Axe with carrying pouch	1 no																									
14)	Electric drill with spare bits Battery operated 2 mm to 10mm (rechargeable)	1 no.																									
15)	Electrically operated chain saw, Power consumption - 1600 W minimum, Voltage - 220 - 250 V, Amperage - 7 Amp [Approx], Guide Blade Length - Arm length - 18 inches minimum, Light weight, shock proof body, reservoir for lubricating for chain. With required accessories and electrical cord, Chain with 34/36 numbers of cutting tips. Compatible with chain saw of 18 inch. Guide bar, chain should be in closed ring form – 2 Nos	1 no																									
16)	<div>High pressure pneumatic lifting bags, working pressure 8 bar, made of Kevlar reinforced nitrile rubber with 3 layers aramide reinforcement, non slip design, capable of being interlocked when 2 bags are placed on top of each other, quick connection with automatic double locking system, centering cross on both sides, reflecting labels, CE-icons for safety insertion thickness not more than 25 mm including profile, resistant to ozone and range of chemicals etc of the following capacities :-</div> <table><tr><th>Lifting capacity</th><th>Min. Inflation height (mm)</th><th>Min dimensions (mm)</th><th>Weight (not more than) kg</th><th>Quantity</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td>20 tons</td><td>275</td><td>500 X 500</td><td>7</td><td>2 no</td></tr><tr><td>40 tons</td><td>400</td><td>700 x 700</td><td>16</td><td>2 no</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> <div>The airbags are to be supplied with the following accessories</div>	Lifting capacity	Min. Inflation height (mm)	Min dimensions (mm)	Weight (not more than) kg	Quantity						20 tons	275	500 X 500	7	2 no	40 tons	400	700 x 700	16	2 no						1 set
Lifting capacity	Min. Inflation height (mm)	Min dimensions (mm)	Weight (not more than) kg	Quantity																							
20 tons	275	500 X 500	7	2 no																							
40 tons	400	700 x 700	16	2 no																							

Sl.No.	Item		Quantity
	Pressure reducer 300 bar to 8 bar	2 nos	
	Control box for operating 2 airbags with pressure gauges and carrying strap	1 nos.	
	Single control unit	2 nos	
	Air Hose 5 mtrs	2 nos	
	Air hose 10 mtrs	2 nos	
	Shut off hose with safety valve	4 nos	
	Connection piece to connect two air cylinders	2 nos	
17)	Hydraulic spreader with pulling chains and adaptors as per the following specifications :- Spreading distance - Not less than 600 mm Spreading force - Not less than 4 T measured at 25 mm from the tips as per EN 13204 Spreading force - Not less 30 T Squeezing force - Not less than 6 T Pulling distance - Not less than 425 mm Pulling force with pulling attachments - Not less than 8 T Weight - Not more than 26 kgs		1 no
18)	Hydraulic cutter as per the following specifications Blade opening - Not less than 225 mm Cutting force - Not less than 35 T Weight ready for use - Not more than 20 kg Capable of cutting round steel bar - Not Less than 32 mm The material of the steel profiles shall conform to EN 10025-1-2000 table 5, type S 235 JR and the cutter shall be able to cut the other various sections as stipulated in EN 13204 category H		1 no
19)	Hydraulic Telescopic Ram as per the following specifications :- Spreading force 1st plug. - Not less than 20 T Spreading force 2nd plug.- Not less than 8 T Length retracted - Not more than 550 mm Extended Length - Not less than 1250 mm Weight - Not more than 21 kgs		1 no.
20)	Hydraulic pump for 2 tools simultaneous operation with 10 mtrs long hose as per		

Sl.No.	Item	Quantity
	the following specifications :- Engine - Petrol engine Capacity oil tank (effective / usable) - Not less than 3.6 litres Pump type - 2 stage radial pump Weight - Not more than 35 kgs No. of tools connected - Two No. of tools to be operated simultaneously – Two	1 no
21)	Hydraulic foot / hand operated pump mounted on suitable base plate with 5 mtrs long hose. The pump shall have two-stage operation and shall be capable of developing adequate pressure for operating all the tools including the telescopic ram up to their full capacity	1 no
22)	Evacuation system (rope rescue with tripod and descenders etc) consisting of a Tripod with rope rescue modular evacuation device ratio 3:1. The weight of the Tripod should not be more than 15 kgs and should have 4 point SS anchoring system on the top with aluminum die cast locking system. All the three sides of the tripod should allow entry of the person without obstacles like chain etc. The load carrying capacity shall be 500 kg and the breaking strength of 1000daN. Their shall be 8 adjustable index positioning. A harness shall be provided consisting of 1 Dorsal attachment D ring / 1 rescue D ring (rear), 2 Lateral attachment D rings, Positioning belt, Fully adjustable shoulder and thigh straps, net weight 1.6 Kg.,and Rescue strap with hooks for 2 <sup>nd</sup> person. It shall also have a ascending / descending device of 100 operating range with 400 mtrs braided rope of polyamide material of 9 mm dia. The braking of descending load shall be by the friction of the rope on the drum, while a ratchet gear facilitates ascension Control and Descent Speed. The Permissible Load shall e 250 Kg with pulley reduction ratio of 3:1 The weight of this unit shall not be more than 1.75 kg A ascending and locking handle made of light alloy shall also be provided with special gear belt for rope rescue and sit harness.	1 set
23)	Loud hailer battery operated	1 no

## 2.11 Quick Response Tender / Vehicle (QRT/QRV)

Approximate Cost: Rs. 9 Lakhs.

The Quick Response tender (QRT) with water mist firefighting systems shall have filling volume of 600 liters of water. It should be designed to be mounted on most standard pickups and trailers. It should have minimal requirements of space and weight while optimizing on manpower requirement and minimizing the water and other collateral damage to negligible in comparison to conventional water tender. The Unit design is complete with opening roller shuttle and frame, which provide protection for the unit itself and easy transportation.

### 2.11.1 SPECIFICATION DETAILS OF THE UNIT

- Weight of empty 600 liters Complete Unit : <300 kg( Max)
- Max. Measurements of the unit (in mm) : 1400(L) x 1300(W) x 1150(H)
- Usable Water capacity : >550 liters
- Built in foam agent tank : ≥40 liters
- No. of deliveries : 1-Nos

### 2.11.2 MAIN EXTINGUISHING GUN (WATER)

- Weight of extinguisher gun : 2 kgs Max.
- Gun Dimensions : As compact as possible.
- Working pressure on the nozzle : 60 bars max with nominal reaction
- Throw : Jet –not less than 15m (+/- 10%)
- Spray : 6m (+/- 10%)

### 2.11.3 SECONDARY EXTINGUISHING GUN (WATER/ FOAM)

- Weight of extinguisher gun : 2 kgs Max.
- Gun Dimensions : As compact as possible.
- Working pressure on the nozzle : 60 bars max with nominal reaction
- Throw : Jet –not less than 15m (+/- 10%)
- Spray : 6m (+/- 10%)
- Hose reel : 30 meters (standard) on manual drum
- Max. set operating pressure : 40 bars
- Starter  
ride : Electric starter with provision of Pull cord over-
- Level Indicator : Mechanical

### 2.11.4 MAIN PUMP

The pump should be capable of suction of water from tank and to maintain adequate discharge rate and pressure for operation of nozzle at optimum efficiency.

- Max. Pressure : 40 bars
- Max flow : 70 l/min
- Power of the engine : Not less than 13HP

- Fuel :Unleaded Petrol

### 2.11.5 ENGINE

The prime mover for pump shall be 4-stroke Petrol driven engine and shall have compatible electrical and lubrication system. The engine should preferably be on 12V battery for which adequate charger shall also be provided. Suitable electronic instruments shall be provided on the body of engine/ panel for fuel level, battery and temperature.

The engine must have electric starter and emergency manual starter

### 2.11.6 FOAM MIXING SYSTEM

A suitable means shall be provided for mixing of foam from tank so that proportion for delivery remains constant and foam quality is maintained.

- Size of foam tank :40lts( Min).(included in the water tank)
- Max. mixing :6% ( From 0.1 to 6% adjustable)

The foam should be mixed inside the pump not through a venturi system for a better mixing of foam. The foam mixing system should prevent the return of foam inside the water tank.

The unit should be able to deliver a very good quality of low, medium and high expansion whatever the length of the hose, the pressure drops and the pressure.

### 2.11.7 ACCESSORIES

Electric starter (Enabling the unit to be electrically started) – 1 no

Utility light 12V 55W complete with telescopic bar -1 no

Complete control panel – 1 no

Hour counter – 1 no

Aspiration kit complete with 6 meters suction pipe – 1 no

### 2.11.8 DESCRIPTION

- The Water Mist Firefighting System will be a self driven firefighting unit operated with inbuilt Petrol Engine coupled to a pump and attached with a reducer & hose pipes, Mist generating Guns. .
- The water mist system shall be capable of carrying 600 (Six hundred) liters of water and foam made of GRP and for AFFF a separate system to pump and mix the required ratio, which can be discharged in the form of a mist from a gun.
- The discharge gun shall be of light weight having stainless steel/brass nozzle capable of producing Water Mist with the ability to control the discharge in short burst and long shots
- The foam required shall be aqueous film forming foam (AFFF).
- The unit shall have adequate provisions for safety of the system.

### 2.11.9 SAFETY DEVICES

The following safety device shall form part of equipment.

- The system will have proper heat & exhaust outlet for the engine without causing any interference to the operator while operating the unit.
- Any other safety device which is felt to be necessary to be a part of the equipment.



#### **2.11.10 MAIN WATER TANK**

The water tank shall be made of GRP giving a free corrosion for life and a lightweight of the WATER MIST SYSTEM, having useable water storage capacity of 600 Liters properly baffled into segment to reduce water surge. The thickness of the water tank should be of 5mm minimum. A manhole of 330 mm avec overflow pipe and an optical level of water should be part of the tank. The tank should resist to the flame and be anti ignition complying with the standards.

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The tank must be monolithic (one-piece design) to eliminate the problem of the limited mechanical resistance to lateral and centrifugal forces of the tank when vehicle driven on uneven ground. The details of material of tank along with specification shall be indicated in the offer.

#### **2.11.11 HOSES**

The hoses provided in the system shall be high quality and shall be capable of holding the temp. ranges -50 to + 600C. The material specification, working pressure, test pressure and cracking pressure should be indicated for each type of hose. The minimum length of each hose should be 30m. The seals and O-rings used in the system should be of synthetic material like Nitrile rubber or equivalent.

#### **2.11.12 OPERATING CONDITIONS**

Water Mist Firefighting system shall operate satisfactorily under the following climatic conditions.

- Variation of ambient temperature from -20°C To 55°C with 98% relative humidity.
- Dusty and corrosive atmosphere with dust content in air up to 1.6 gm/ cubic meter.
- Altitude – Up to 1200m above Mean Sea level.

#### **2.11.13 MARKING**

Marking shall give details of capacity, manufacturer's name, month / year of manufacturing of the system etc.

#### **2.11.14 TEST OF ACCEPTANCE OF FIREFIGHTING SYSTEM**

Physical dimensions, performance & weight check of equipment as given under different items above shall form part of test of acceptance.

## 2.12 Motor Cycle with Two Mist Backpacks

Approximate Cost: Rs. 6.75 Lakhs.

A water mist based firefighting system utilizes very fine water spray to extinguish fire. Water is recognized as an outstanding physically acting firefighting agent with exceptionally high heat absorbing capacity and latent heat of vaporization. Water droplets with size of 1 to less than 1000 micron are referred to as mist. The water mist when used in firefighting systems creates a blanket thus making the atmosphere inert around the fire. This results in effective and rapid fire extinguishing. The compressed air foam (CAF) used along with water mist further enhances the fire extinguishing power.

### 2.12.1 GENERAL SPECIFICATION DETAILS OF THE UNIT

- A pressure vessel to hold the media with safety valve, a compressed air cylinder coupled with a reducer, hosepipes for discharge of water mist media and extinguishing gun are the main components in the configurations covered in the specification. The system uses a mixture of water and aqueous film foaming foam (AFFF) as media. Compressed air is used as propellant for the media through nozzle where atomization takes place.
- High Pressure systems have only one airline with air performing the roles of propellant and creating mist in one stage itself. High Pressure systems deliver the media comprising of water mist laden with AFFF film, guns, different sizes of air cylinders and different materials of construction for pressure vessels and air cylinders. The indenters can select a system as per their requirement.
- Two types of AFFF compound are available, the standard type conforming to UL-162 and the special type to manufacturers own specifications. The special AFFF compound is offered for achieving higher fire ratings as specified against individual items in this specification.
- These systems shall be provided with universal cylinder holder to hold the cylinder so that the user can have flexibility to use 200 bar and 300 bar cylinders.
- The backpacks shall conform to EN 3-7:2004+A1:2007 standards as applicable for portable type fire extinguishers and fire ratings shall be tested accordingly except for the deviations in weight (which is in excess of 20 Kg), the nominal charge/capacity (which are specifically mentioned in this specification) and the safety feature as specified in Para 10.3 (second sub Para) of EN3-7 regarding manual attempt to initiate discharge without releasing the safety device; as the backpack is a different type of configuration from the conventional portable fire extinguishers.
- The system shall include a pressure gauge to monitor air cylinder pressure. The pressure vessels shall be painted red and provide markings as per clause 16.2 of the EN 3-7:2004+A1:2007(E). The air hoses shall be suitable for minus 40 deg C to 100 deg C temperatures and conforming and marking to EN standards.
- The air cylinders and pressure vessels shall comply with Gas Cylinder Rules 1984 and shall be supported by manufacturers test certificate. No objection certificate or approval as applicable, from Petroleum and Explosives Safety Organization (PESO) Nagpur shall also be furnished.
- All system shall be designed for maximum operating temperature  $T_{Smax}$  and minimum operating temperature  $T_{Smin}$  of 60 deg C or more and 5 deg C or less respectively and certified by the manufacturer accordingly.

- The complete system shall be tested from an internationally accredited laboratory for compliance to EN 3-7:2004+A1:2007 (E). For backpack configurations, specified fire ratings shall also be tested from such laboratory.
- For systems built from imported SKD kits the test report as above on OEM products with fire rating test report from a reputed Government institution like CBRI Roorkee, ERDA on the product assembled in India after value additions will also be acceptable. In such cases the suppliers shall clearly indicate the value additions made by them in India and shall furnish specific consent of the OEM for the value additions made along with a confirmation that fire ratings of the equipment would not be affected by these additions.

### **2.12.2 BACKPACK & HANDHELD TYPE: HIGH PRESSURE WATER MIST & CAF FIREFIGHTING SYSTEM 10L.**

Backpack configuration shall be mounted on a sturdy frame suitable cushioned for comfort, provided with shoulder pads for carrying as a backpack and a handle to be carried by hand. All materials used shall be of fire retardant type.

The supply shall include along with the system,

- a spare compressed air cylinder of the same size,
- pressure and material,
- 10 nos O-rings for the pressure vessel,
- one can of 5l standard AFFF compound,
- one can 5l special AFFF compound,
- tool kit, manufacturers test certificate, operation manual and spare parts list.

#### **2.12.2.1 Fire rating:**

A21 with standard AFFF compound, A55 with special AFFF compound, B233 and electrical fires on up to 1000 volt.

- Extinguishing gun: Stainless Steel, 750 g (approx) weight suitable for all the three classes of fires
- Pressure Vessel: Aluminum alloy vessel with 10 l filling capacity
- Compressed air cylinder : 2 l 200 bar steel cylinder mounted on a universal cylinder holder capable of holding 200/300 bar cylinders
- Length of hose : 1.3 m,
- Dynamic working pressure : Above 30 bars
- Lancing distance of gun: 12 m or more
- Operating time in full throttle : 20 s or more
- Weight of fully charged system : 27 kg max

### **2.12.3 MOTORCYCLE MOUNTED: HIGH PRESSURE WATER MIST & CAF FIREFIGHTING SYSTEM (10L BACKPACK & HANDHELD)**

In this configuration, two backpacks shall be mounted on the motorcycle Royal Enfield Electra 5 Speed 350 cc or similar configuration models. Also mounted on motorcycle shall be front windshield ( 2mm thick FRP), leg guard (made from 25mm diameter 16 gauge nickel plated steel pipe), a Siren (12V 30 Amp audible at a distance of 200m), two blinking lights (12V 20W each red lights with flasher), First Aid Box (cotton absorbent 100g, Band Aid 10

pcs, Burnol 2 pcs, Tincture Iodine 100 ml) and Gel blanket. The motor cycle shall have space to store two air cylinders and breathing apparatus. The windshield shall be duly marked with a logo as desired by the indenter. The two backpacks of High Pressure designs shall have the same specification as specified at (A) above.

The motor cycle mounted configuration uses two backpack type fire extinguishers mounted on motor cycle and the motor cycle is included in the scope of supply. The indenters' can also build this configuration on their own if they decide to buy the motor cycle directly i.e. outside this rate contract. They can buy two backpacks, motor cycle mounting kit (which does not include backpack) and such other add-ons as they require from this rate contract or outside. The motor cycle mounting kit shall include windshield, a hooter, two blinking lights, First Aid Box and fixtures to add space to store two air cylinders or other equivalent items. The windshield shall be duly marked with a logo as desired by the indenter. The cost of motor cycle mounting kit shall include actual mounting of the items on the motorcycle.

## 2.13 BA Van cum Light Van cum Control Van

Approximate Cost: Rs. 30 Lakhs.

### 2.13.1 CHASSIS

The fabrication of BA-Cum- Light Van-Cum-Control Van shall be made on Tata LPT 1615/52 Cowl chassis/ Ashok Leyland Comet Gold 1616-4330MM (170.5") WB Goods or similar configuration manufacturer's chassis. The chassis is without drivers cab, windshield and wiper.

### 2.13.2 BODY WORK/ STOWAGE/ CABINS

The vehicle shall have 03 independent cabins for light van and control van, BA van excluding

of drivers cabin.

- Enclosed accommodation with double compartment for six people including driver and a officer in the front and a crew of four at the rear shall be provided. The driver seat shall be of adjustable type. The design of the cab shall be such that it affords max. possible vision. Two-hinged door shall be provided on both side of the appliance for easy access to driver and crew. All doors shall open outward and hung forward. The locking arrangement shall be with double catch striking plate. Non-slip step and grab rails coated with plastic shall be provided to assist the driver and crew to get in and out. All the seats shall be fitted with 100mm thick foam cushion. All windows shall have safety glasses and all glasses be fitted with winding type regulator. Two number sun visors shall be provided one on each side. The construction of cab shall be such that the roof shall support the weight of two men without damage.
- The cab & body of light van, control van & B.A van shall be composite construction with sufficient rigidity reinforcement and to be kept as light as possible. The entire structure shall be made of 32 x 32 x 1.6 mm square tube of M.S. Aluminum sheet (16 gauge) shall be used for exterior paneling work all over. For inner wall of the doors, 16-gauge mild steel sheet shall be used. Aluminum checkered plate (2.5 mm thick) shall be used for flooring. Inspection/maintenance hatch of removable type shall be provided in the cabin for gaining access to gear box/P.T.O.

### 2.13.3 TELESCOPIC LIGHT MAST NIGHT SCAN MAKE

A compact, low profile, roof mounted lighting system, fitted with 4 X 1000 watts metal Halogen lamps, vertically elevated pneumatically up to 4.6 meters. from rooftop. Lighting shall be provided by a 12V or 24V DC 230 volt/AC having REMOTE CONTROL POSITIONER having directional lighting system with rotation & tilt lamps to provide total coverage. The remote control unit shall allow a person to operate all the functions of the light mast & accurately aim for complete directional positioning. In addition Auto-show, a one button command. automatically retracts, turns out the lights and stows the entire system to the compact transport position shall also be included in the remote controller.

### 2.13.4 ALTERNATOR UNIT

An inbuilt Alternator of 20 kW (25 KYA) shall be installed, which shall be driven by the

PTO unit of a suitable type. The alternator shall be placed at the level higher than the floor level

of the vehicle so that in case off loading the electrical are not affected.

The control panel of the alternator shall include:-

1. Three sockets (plugs) and switches with 3 phase connections
2. Four sockets (plugs) & switches (MCB's) with single phase connections of min. 20 AMP capacity
3. Four sockets (plugs) & switches (MCB's) with single phase connections of min. 10 AMP capacity
4. RPM Meter digital - 1 No.
5. KW meter - 1 No.
6. Ampere meter separate for each phase - Total - 3 Nos.
7. Frequency meter - 1 No.
8. 32 Amps. TPN MCB - 1 No.

#### **2.13.5 CONTROL VAN CAB**

The control Cab shall have provision for a folding table of 0.4x0.3m for laptop and a suitable fixed table for desktop computer with printer.

Specifications of laptop and desktop computer with printer are placed annexure-I

1. Rack for instruments, telecom and telemetry cards bin and documents cabinet be provided

in the control cab.

2. Provision for wireless set and arguments for 12 walkie-talkies charging unit shall be provided.

3. 02 nos. of folding chairs shall be provided.

4. Space for housing 25 plate automobile batteries at lower level/exterior part of the cab in easily accessible position.

5. Lighting system to facilitate reading & writing

Mechanized ventilation for affording human occupancy with all doors closed.

#### **2.13.6 BA SET CAB**

A door shall be provided at rear to enter the BA set cab. Provision body work shall be made to accommodate 42 nos. of BA set (30 in boxes & 12 in hanging position so that the sets are not damaged during vehicle movement. These shall be secured in such a manner that once stowed, they do not move around in transit as well as are be easily accessible when the need arises.

#### **2.13.7 WORKMANSHIP AND FINISH**

All parts of the appliance shall be of good workmanship and shall have streamline finish. All mechanical and other part shall be such that parts normally required to be replaced can be supplied and fit correctly.

The appliance shall be painted fire red (two coat) conforming to shad 536 of IS. 5-1978 and paint shall conform to IS 2932. Necessary anti-corrosion and priming coat shall be applied before painting in order to achieve gloss finish. The under chassis shall be painted black. The inside of locker and driver/crew compartment shall be painted cream.

Fire Service insignia shall be painted on both side of the appliance in yellow & black.

#### **2.13.8 INSPECTION AND ACCEPTANCE**

Stage wise inspection shall be carried out at vendors works by State Fire Services representatives.

All OEM & Vendor Manuals/ Test Certificates/ Fitness Certificate etc. pertaining to vehicle and accessories shall be provided on the vehicle at a suitable place.

The design drawings of the vehicle will be submitted to corresponding State Fire Services for approval prior to stating the job.



## 2.14 Educational Van

Approximate Cost: Rs. 20 Lakhs.

This vehicle will be primarily used for education of schoolchildren & about fire & life safety.

### 2.14.1 CHASSIS

The fabrication of mobile training cum education van shall be done on a chassis supplied by the Department.

### 2.14.2 FABRICATION

- The overall vehicle shall be fabricated from steel and aluminum sandwich panels duly insulated before bonding with a total thickness of min.25 mm (side panels) and 30 mm (roof panels).
- The floor shall be made of plywood, or equivalent material, and covered with and easy to clean anti-slip rubber / PVC layer / tiles. At the right rear side of the compartment a door shall be installed. The door can be opened from the inside and outside. The door shall be protected against corrosion while the door sealing will prevent water to entering when the door is closed.
- The Training compartment shall feature three windows fitted in the side panels on the right side of the vehicle, the windows shall be made of protective glass. In the roof 2 hatches shall be provided for ventilation, daylight and for escape purposes.
- Body color and stripping shall be as per Fire Brigade norms i.e. PO Red.

### 2.14.3 ELECTRICAL INSTALLATION

- The electrical wiring and equipment used / installed shall have protection level as conforming to IP44. The electrical installation shall be protected against overloads and shortcuts. A circuit breaker shall be installed for extra safety.
- All connectors, control and warning lights will be clearly positioned. At the left side of the front wall of the vehicle, a metal clad 220 volts connector with safety cap shall be installed for connection of external power. Suitable cable lead of 60 meters minimum with suitable plug at both ends shall be provided along with the vehicle for connecting external supply of power.
- The inside of the Training compartment shall be fitted with 220 V CFL lights (PHILLIPS or equivalent) installed in protective case. Above the entrance door on the outside, a 230
- V lighting unit shall be installed.
- The training compartment shall be fitted with surge protection and power conditioning, in order to safeguard vulnerable equipments such as computers, communication equipment etc. from power surges, lightning and other power anomalies.
- For air refreshment, an electrical ventilator shall be installed in the wall.

### 2.14.4 GENERATOR

A Honda or similar make 5.5 KVA silent type of generator will be provided and installed at suitable location on the vehicle.

The generator will be capable of being used for internal equipment as well as for external equipments in case of emergencies. The Frequency of the generator will be 50 Hz.

#### 2.14.5 AIR CONDITIONING UNIT

A vehicle driven A/C unit of minimum 2.5 tons capacity with good ducting system throughout the vehicle shall be provided for efficient cooling of the compartments. The system should be effective in ducting vent system and be silent in operation.

#### 2.14.6 TRAINING COMPARTMENT (INTERIOR)

One number of air curtain should be installed on top of the rear door to prevent dust, insects etc from entering the vehicle as well as for better air-conditioning, when the door is open.

Sufficient numbers of CFL lights for efficient lighting of all kiosks.

Wall mounting fans – 04 nos. of Crompton or equivalent make shall be used.

The following training material shall be provided with the vehicle.

(i) M/S tray of dimensions                      6 x 3 - 3 Nos.

4 x 2 - 3 Nos.

3 x 3 - 3 Nos.

All the trays should be able to be stored one inside the other and be lockable with snap fit. Suitable inconspicuous space be provided for safe storage and easy recovery of the stored trays.

(ii) The details of overhead projector and other accessories are specified below:

LCD TV 32" with DVD Player	01 no. KLV-32V 400A Sony.
Lap Top	01 no. VGN-CSI8GN/B Sony.
HDD	01 no. HDR-SRIO E 40 GB Sony.
PJTX-100	01 no. Hitachi or any other similar make.

Overhead projector with screen - 01 nos. as per specification given in Annexure "A".

The projector shall be mounted inside the vehicle at almost the rear door opening and be foldable as well as swivel type so as to enable screening on any outside screen from the vehicle. Another pull down screen shall be provided inside the vehicle so as to enable screening inside the vehicle if so desired.

LCD TV 32" with DVD Player 01 nos. as per specification given in annexure "A".

(iii) Following ISI portable extinguishers 01 each:

- a. Water Co2 extinguisher 9 ltrs. capacity.
- b. DCP Extinguisher 5 kg. capacity.
- c. Mechanical foam extinguisher 9 ltrs. capacity
- d. ABC extinguisher 5kg. capacity.
- e. Co2 extinguisher 4.5 kg. capacity.
- f. Modular extinguishers 2kg. capacity.

Above extinguishers shall be displayed in snap fitting vibration free type display panel inside of the vehicle. Extinguishers shall be easily removable from display panels and clear

markings by fixing name plates be provided for easy identification of type of extinguishers. At least 05 refills of all types of above extinguishers shall be provided with each vehicle with a suitable locker for safe and inconspicuous storing of refills. All extinguishers shall be ISI marked.

- (iv) Common fluorescent signage's 150x300 mm size "Exit" "STAIRCASE" & "do not use lift in case of fire" 50 each.
- (v) Stowage for Breathing Apparatus-O I Nos. with spare cylinder (To be supplied by the department).
- (vi) Stowage for fire proximity suit – 01 nos. (To be supplied by the department).
- (vii) One Handy Cam as per specification given in annexure "A".
- (viii) First Aid Box – 01 nos.
- (ix) Fire alarm system with 02 nos. smoke detectors and 02 nos. heat detectors, which can be used for dual purpose of protection of the vehicle as well as for display purpose. The system shall be fully operational with one no. manual call point, one internal and one external hooter, rechargeable maintenance free battery back-up and shall have provision for simulating fire conditions (Both for smoke as well as for heat) for display purposes.
- (x) External Display of Working System: the vehicle shall have a 500 Liter Water tank suitably placed with a 450 LPM. @ 40m head deliver water through a fire hose of 38 mm dia and piping permanently connected to O I nos. 38 mm hydrant valve, hose reel and a single sprinkler. The system should be able to simulate fire condition where "without any actual fire" the fire can be started with press of a switch and fire glow is shown in fiber glass fabrication. In the process when temp reaches 68 C the sprinkler is operated and falling water on the fiber "extinguishes" the so called fire. The system should be fit only for demonstration and no actual fire should be needed for this purpose. 01 no. 38 mm fire hose 7.5 Meters. length with hose couplings and branch pipe should be provided so that demonstration of this item can be held. Suitable pressure gauge and thermometer near sprinkler should be provided for ease of display. Filling connection for water tank shall be provided.

#### **2.14.7 TRAINING COMPARTMENT (EXTERIOR)**

- On the exterior of the vehicle, folding gull wing type of doors will be provided, which will have the various procedures of training imprinted on them.
- These doors will be made of robust frame that can support the entire weight of the glass. The doors will be held up by pneumatic / hydraulic jacks that can be operated from inside the vehicle only.
- The glass doors will have reverse screen-printed vinyl on the backside so that the same is protected from physical damage. Once these glass doors are lifted, they will expose the internal wall of depictions.
- The internal wall shall be so made that there is minimum projection into the interior compartment. This wall will house the pictograms and the interactive boards of the department.

#### **2.14.8 COMPUTER**

Stowage for 2 nos. of computers and peripherals shall be provided. There should be suitable electrical connection, suitable furniture for accommodating provided.

#### **2.14.9 SIGNAGE/ MARKINGS**

All the signage shall be as per international standards and all the markings shall be in "English" language only.

#### **2.14.10 FINISH**

Surface treatment of the Training Vehicle shall be suitable for the working environments under the local climatic conditions.

#### **2.14.11 PAINT**

The vehicle shall be coated in a 3 layer high quality coating in color Po Red / Fire Brigade Red and provided with striping as per striping/marketing scheme. Corrosion protection for undercoating and hollow space and all other places as required for the protection of any part of vehicle shall be provided.

#### **2.14.12 INSTRUCTION PLATES (IF AND WHERE APPLICABLE)**

Instruction plates made from a non-corrosive metal, are to be fixed in such a position that they can be easily read by the driver and crew.

Theses plates are to indicate in English, any instructions, warnings or precautions necessary for the operation of the vehicle and supporting vehicle. The instructions, warnings or precautions, which affect life and limbs, are to be lettered permanently in Red. All instructions shall be in luminous paint to facilitate ease of reading at night.

Drawings of the vehicle should be submitted and got approved from the department before commencement of fabrication.

#### **2.14.13 INSPECTION**

Two stage inspections will be carried out.

1st Stage - Structure

2nd Stage - Final inspection as per specification

## 3 General Specification for Firefighting and Rescue Specialized Equipment

The detailed specifications of firefighting & rescue specialized equipment are mentioned below:

### 3.1 Hydraulic Rescue Tools (Heavy)

Approximate Cost: ₹15 Lakhs

#### 3.1.1 GENERAL REQUIREMENT

- The Hydraulic Rescue tools shall be portable and light-weight, and shall be suitable to use by one man.
- The Hydraulic Rescue tools shall be supplied in set form, consist of main equipment like spreader, cutter, telescopic ram and hoses, power pack or hand pump along with all the accessories.
- The Hydraulic Rescue tools and its accessories shall comply with all the requirements stipulated under EN 13204 or equivalent national/ international standards.
- For the safety of the operators, victims and bystanders, the tools shall be powered by non-toxic, mineral-based hydraulic oil. Any toxic fluid shall not be used.
- All pressure hoses shall have a safety factor of not less than 4 times the maximum working pressure. All hoses shall be provided with anti kink springs with exception of the non-kinking one hose system.
- All tools, hoses and pumps shall be equipped with compact, non-drip quick-connect couplings fast and easy connection. All female couplers shall be equipped with automatic self-locking to prevent accidental disconnecting. Preferably, the couplers would have 360 degrees free movement for the easy of uncoiling.
- The hydraulic rescue tools shall be designed to withstand a test pressure of two times their maximum working pressure. Each tool has to be equipped with two internal safety valves for protection against any type of mechanical or hydraulic overload for each cylinder and each tool shall have a separate safety valve for protection against overpressure in case one of the return couplers is disconnected. Moreover, all tools shall be tested for safety according to the American UL requirements (e.g. full load cycle tests) and comply with the European CE safety standards and European Norm. EN 13204
- All hydraulic rescue tools shall be equipped with automatic double pressure check valves to hold any load in any position when the control valve is in neutral position, or in cases of disconnected couplers or sudden pressure drops.
- The cutters, and spreaders shall be provided with a non-slip, U-shaped carrying handle which allows the operator to reposition the tool from one side to the other (left to right and back) without the need to reposition the hand or to release the handle in order to do so. The carrying handle would be mounted in such a way that the tool is fully balanced, even when the tool is picked up with one hand. The position of the carrying handle and the control handle shall allow easy operation for right handed as well as left handed operators.

- Hydraulic rescue tools shall be provided with, double acting hydraulic cylinder with a dead man's type control and shall be able to operate easily with one hand by the operator in any position.
- The tools shall be provided either with two hoses, one for pressure line and another for return line or one coupler allowing a pressure line and return line within one hose. The hoses shall be fitted in the center of the handle to avoid personal harm in case of leakage. The hoses shall allow full 360° rotation and shall be in case of dual hose system equipped with anti-kink springs.
- The tool body, yokes, and spreader arms shall be made out of high quality aluminum alloy for solid construction with low weight. All aluminum alloy parts shall be anodized as a protection against corrosion and scratching. All hinge pins, levers and cutter blades shall be made out of high tensile (heat-treated) tool steel, blackened as protection against corrosion.
- The tools construction shall allow under water use for long periods without the risk of any material damage to any part of the tool.
- All hydraulic tools, pumps, hoses and accessories would be fully operational for longer periods at temperatures of -20 up to + 60° C.
- The tools shall be supplied with proper operation / safety instruction manuals, according to the standards. Operation and safety instructions shall be on the tools and shall be in pictogram style so that they shall be understood by all operators easily.

## TECHNICAL SPECIFICATION OF TOOLS

### 3.1.2 SPREADER

- The spreader shall be double acting hydraulically operated device of lightweight construction made of anti corrosive high strength material capable of being lifted, and operated manually with ease.
- The spreader would be capable of spreading; and pulling with the combination of chains.
- In the tool with two hose system, the tool shall be supplied with connection hoses of min. 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.
- The spreader shall be provided with spreading tips made of fully hardened, high tensile tool steel with proper serrations outside and inside for a perfect grip during spreading as well as squeezing operation. The tips shall be mounted on the spreader arms by means of a quick locking system.
- Pulling adaptors and pulling chains shall be offered as accessories. These accessories shall be quick lock type. The pulling adaptors shall be equipped with shortening hooks, which easily fit in each shackle of the pulling chains to assure quick connection. The pulling chains shall be equipped with the same shortening hooks in order to easily mount the chains to any object of whatever size or shape.

The spreader shall have following specifications:

Spreading distance		Not less than 600 mm
Spreading force measured at 25		Not less than 4 T

mm from the tips as per EN 13204		
Spreading force		Not less 30 T
Squeezing force		Not less than 6 T
Pulling distance		Not less than 425 mm
Pulling force with pulling attachments		Not less than 8 T
Weight		Not more than 26 kgs

### 3.1.3 CUTTER

- The cutter shall be double acting hydraulically operated device of light weight construction made of anti corrosive high strength material.
- The cutter shall be capable of cutting of various sections such as solid round bar, hollow round bar, flat section, square tube, rectangular tube etc. It would also cut the door pillars of new generation cars.
- In the tool with two hose system, the tool shall be supplied with connection hoses of min 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.
- The cutter blade shall be parrot type, the cutting blades shall be of shock resistant non corroding alloy steel, hardened and ground and shall be exchangeable and regrindable. The cutter shall also be able to cut the other various sections as stipulated in EN 13204 category H or equivalent category as per international standards.

The cutter shall have following specifications:

Blade opening		Not less than 150 mm
Cutting force		Not less than 90 T
Weight ready for use		Not more than 20 kg
Capable of cutting round steel bar		Not Less than 40 mm
The material of the steel profiles shall conform to EN 10025-1-2000 table 5, type S 235 JR		

### 3.1.4 COMBI TOOL

- The combi tool shall be double acting hydraulically operated of light weight construction made of anti corrosive high strength material.
- The combi tool shall be capable of cutting of various sections such as solid round bar, hollow round bar, flat section, square tube, rectangular tube etc. It would also cut the door pillars of new generation cars.



- In the tool with two hose system the tool shall be supplied with connection hoses of min. 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose
- The blades shall be of shock resistant non corroding alloy steel, hardened and ground and shall be exchangeable and regrind able.

The combi tool shall have following specifications:

Spreading Distance	Not less than 250 mm
Spreading force measured at 25 mm from the tips as per EN 13204	Not less than 2.5 T
Spreading force	Not less than 20 T
Cutting force	Not less than 25 T
Squeezing force	Not less than 4.5 T
Pulling distance	Not less than 175 mm
Pulling force	Not less than 4,5 ton
Weight	Not more than 21 kgs
Capable of cutting round steel bar	Not less than 24 mm
The material of the steel profiles shall conform to EN 10025-1-2000 table 5, type S 235	

### 3.1.5 RESCUE RAM

- The ram cylinder shall be double acting hydraulically operated device of lightweight construction suitable for manual application with ease.
- The ram shall be capable of lifting and spreading operation.
- In the tool with two hose system, the tool shall be supplied with connection hoses of 0.5 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.

The ram shall have following specifications:

Spreading force	Not less than 12 T
Pulling force	Not less than 5 T
No. of Plungers	2 or 3
Spreading / pulling stroke	Not less than 300 mm x 2
Retracted length	Not more than 1000 mm

Extended Length	Not more than 1500 mm
Weight	Not more than 25 kgs

Accessories: All accessories like Flat Base, Wedge Tip, Cross head, Conical tip, etc shall be supplied along with the Ram.

### 3.1.6 HYDRAULIC POWER PACK

- There shall be gasoline engine driven power pack suitable to operate all rescue tools in the delivery program of the supplier
- This petrol driven hydraulic power pack shall be capable of powering tools, independently and have connection possibility for additional tools. For this purpose, the pump shall be provided with separate connecting valves, incorporating a manually operated pressure release valve. The valve shall have two positions, operation or neutral. Even when under full pressure the release valve would be easy to operate and release the pressure. This arrangement is not applicable for one hose system.
- The hydraulic pump shall be driven by a 4-cycle, single cylinder, air cooled petrol engine. The power of the engine shall be sufficient to drive the hydraulic pump to give output sufficient to operate the two tools simultaneously without reduction in the speed.
- The petrol tank capacity shall be such that, it allows the engine to run for minimum one hour when the tools are continuous operation.
- The starting system of the engine shall be hand recoil type and the starting rope shall wound automatically in when released.
- The engine and the pump shall be mounted on suitable tubular carrying frame with integrated carrying handle.
- The noise level of the power pack when the engine is running shall not be more than 86 dB.
- There shall be means to find out the quantity of fuel and hydraulic oil in the power pack, and same shall be easily accessible visible means have preference. The provision shall also be made to refill the petrol and hydraulic oil through wide filling opening which shall be covered with threaded cap.
- All the hot parts of the power pack shall be properly shielded to avoid possibility of injury to the operator.
- All the controls on the power pack shall be easily accessible and properly labeled in English language.
- The weight of the power pack shall not be more than 35 kg
- The power pack shall be provided with 2 x 2 stage radial piston pump with a minimum output of 2400 cc/min per valve in the first stage and at least 600 cc/min per valve in the second stage. Each pump shall be provided with an automatic changeover valve that switches the first stage output to no load to assure the high output in first stage and second stage. Each pump shall be protected with two internal safety valves, factory set at a suitable maximum pressure.
- The usable oil capacity of hydraulic oil tank shall be minimum 3,6 liters to supply the sufficient quantity of oil to two tools simultaneously with ample reserve capacity for the re-circulation of oil to avoid the overheating in prolonged operation.

The specifications are given below:-

Engine	Petrol engine
Capacity oil tank (effective)	Not less than 3.6 liters
Pump type	2 stage radial pump
Weight	Not more than 35 kgs
No. of tools connected	Two
No. of tools to be operated simultaneously	Two

### 3.1.7 MANUAL HAND/ FOOT PUMP

- A lightweight hydraulic hand / foot pump mounted on suitable base plate shall be offered as a standby unit for power pack to operate the tools.
- It shall be capable of developing adequate pressure for operating all the tools including the telescopic ram up to their full capacity. It shall be possible to operate the pump even when placed in an inclined/vertical position.
- The pump shall have two-stage operation for low & high pressure.

### 3.1.8 HOSES

- There shall be 2 x a pair of high quality 'Thermo Plastic' hose of 10 meters. in length for pressure and return line with quick connect male and female couplings suitable to connect power pack and tools or one hose system.
- The hoses shall be in two different colors to identify easily. Non-interchangeable hydraulic coupling designed for quick connection/disconnecting shall be provided with dust caps, complete with automatic self-locking system. Not applicable for one hose system.
- The hoses shall have the working pressure suitable for tools and the bursting pressure of the hoses shall be 4 times the working pressure.

### 3.1.9 DOUBLE HOSE REEL

Lightweight high-pressure hydraulic hoses of 25 meter. long with quick coupler. The hoses shall be made of thermoplastic material and shall have safety ratio of 1:4. The hose reel shall be made SS carrying frame & drum for hoses

### 3.1.10 PNEUMATIC LIFTING AIRBAGS (FLAT TYPE -1 SET)

- The bags shall be supplied in the set form having lifting capacity of 3, 10, 30, 40, 67 ton capacity (tolerance for capacity allowed is + 25%, - 5%)
- Working pressure shall be 8 bar and made from Kevlar reinforced nitrile rubber with 3 layers aramide reinforcement.
- Non slip design, capable of being interlocked when 2 bags are placed on top of each other, quick connection with automatic double locking system.
- To be provided with reflective marks and centering cross on both sides
- Insertion thickness of the bag shall not be more than 25 mm including profile.

- Resistant to ozone and range of chemicals etc.

The bags shall have following specifications.

Lifting capacity (Ton)	Minimum Inflation height (MM)	Approx Dimensions (MM)	Approx. Weight (Kgs)	Quantity (Nos.)
03	125	225 x 225	1.5	1
10	200	375 x 375	04	1
30	375	650 x 650	13	2
40	400	700 x 700	16	2
67	500	900 x 900	25	1

### 3.1.10.1 Accessories

- (i) The airbags are to be supplied with the following accessories
- (ii) Pressure reducer 300 bar to 8 bar - 2 Nos.
- (iii) Dual Controller with pressure gauges - 2 No.
- (iv) Air Hose 5 meters. with couplings - 4 Nos.
- (v) Air Hose 10 meters. with couplings - 4 Nos.
- (vi) Single control Unit - 4 Nos.
- (vii) Shut off hose with safety valve - 4 Nos.
- (viii) Connection piece to connect two-air cylinder - 2 Nos.
- (ix) The Dual controller, pressure reducer, single control unit, shut off hose and air hoses
- (x) Shall be supplied in a suitable carrying box. - 1 No

### 3.1.11 SINGLE ACTING COMPACT HYDRAULIC DOOR OPENER

- The door opener shall be hydraulically operated with two toes, one fixed and one moving and it shall be suitable to force open doors of building that open to the inside and that can be reinforced or blocked.
- The spreading force shall be 90 kN [9,2 ton].
- The door opener shall be single acting, spring return type, driven by hand - or foot pump, working on non - toxic mineral based hydraulic oil.
- The insertion height up to the first groove shall not be more than 3mm, whilst the stroke length of the door opener shall not be less than 128 mm.
- The back of the fixed toe shall be designed with a flat face to be used a hammering base. The door opener must be available with a carrying and positioning handle that automatically keeps the tool from twisting when positioning the tools. The carrying and positioning handle would be finished with a black epoxy layer for optimal grip.
- The door opener must be available with a swivel connection that must be mounted on the back of the tool for optimal maneuverability of the tool and hydraulic connection hose.
- Dimension of the tool shall be [l X w X h] 300 X 120 X 105 mm approx. & weight would not be more than 7 kg.

- The door opener shall be supplied with the accessories such as 30 cm pigtail hose and quick coupler, that can also fitted with the additional positioning & carrying handle with a 360 degree rotation elbow, 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box.
- The door opener shall be able to operate by two stage hand pump.

### 3.1.12 SINGLE ACTING COMPACT HYDRAULIC ALUMINIUM JACKS

- The Aluminum jack shall have been made from Aluminum alloy and the cylinder and stop ring shall be anodized for rust protection.
- The jack shall be compact and shall have 2 handle to install it easily in small spaces.
- The return of the plunger shall be affected by air pressure in the jack and the safety valve in the Air Coupler shall be set at 15 bar max.
- The plunger shall have been provided with a tilting saddle to prevent side loading.
- The jack shall be able to operate by two-stage hand pump.

The details of jacks are as under -

Description	Small Size	Big Size
Working Pressure	Approx. 700 bar	Approx. 700 bar
Lifting Capacity	Not less than 50 tons	Not less than 50 tons
Closed Height	Approx 150 mm	Approx 200 mm
Stroke	Approx 50 mm	Approx 100 mm
Weight	Not more than 7.5 kg	Not more than 9.5 kg
Quantity	01 No.	01 No.

The retracted length of big size jack shall not be more than the extended height of the small jack so that step jacking can be effected.

### 3.1.13 SHORING SYSTEM FOR URBAN SEARCH AND RESCUE COMPRISING OF-

- 1 no. Struts with air cylinder retracted length not less than 625mm
- 1 no. Struts with air cylinder retracted length not less than 1000mm
- 1 no. Struts with Hydraulic cylinder retracted length not less than 625mm
- 1 no. Struts with Hydraulic cylinder retracted length not less than 1000mm
- 1 nos. Mechanical strut retracted length not less than 225mm
- 1 nos. Mechanical strut retracted length not less than 550mm
- 2 nos. Hand Pump for operating struts with hydraulic cylinders
- 8 nos. Extension pipe 125mm
- 8 nos. Extension pipe 250mm
- 6 nos. Extension pipe 500mm
- 6 nos. Extension pipe 1000mm
- 4 nos. Connector

- 4 nos. Saddle with round surface
- 2 nos. Saddle with flat plate
- 4 nos. Tilting saddle
- 2 nos. Tilting saddle with steel plate
- 2 nos. beam support 150mm
- 4 nos. L support
- 4 nos. Swivel head
- 1 no. V block
- 1 no. V block large
- 2 nos. Cone head
- 2 nos. Cross head
- 2 nos. Support plate
- 2 nos. Tensioning belt
- 2 nos. Adjustable Hook Wrench

#### **3.1.13.1 Accessories for Struts with Air cylinder**

- 2 nos. Double control unit
- 2 nos. Pressure reducer
- 2 nos. hose 5 Meters. Each
- 2 nos. hose 10 Meters. each.

#### **3.1.13.2 Glass breaker (Punch)**

Glasscutter for cutting laminated glass Inclusive of window punch Inclusive special device to punch first hole in glass Inclusive special device to break side windows on top Max. weight: 1 kg

#### **3.1.13.3 Leak sealing set**

Tank sealing set with high chemical resistance consisting of:

- 1x sealing plate with dimensions of min. 465 x 465 x 30 mm
- 1x harness
- 1x shut-off hose, set at 1,5 bar
- 2x ratchet belt of 10 m length

To be used together with high-pressure lifting bag:

- Reinforced with aramide with light reflecting labels on 3 corners on top side for better visibility in dark environment
- Resistant to chemicals
- Working pressure: max. 1,5 bar

#### **3.1.13.4 Hydraulic Pedal cutter**

The cutter shall have straight blades, one fixed and one moving, with a cutting force of at least 75 kN (7.7 ton). It shall be suitable to cut metal parts like car pedals, steering wheels,

seat frames etc. The cutter shall be of the single acting, spring return type, driven by a hand- or foot pump, working on non-toxic mineral-based hydraulic oil.

The opening in the jaw shall be at least 40 mm, whilst the width of the jaw shall be no more than 40 mm to use the cutter in confined spaces.

#### **Accessories**

The cutter shall alternatively be supplied in the following executions:

- With a quick coupler directly mounted on the bottom of the cutter.
- With a 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box, of which the dimensions shall not exceed (l x w x h) 400 x 300 x 132 mm, euro size.
- With a 360° rotation elbow, 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box, of which the dimensions shall not exceed 400 x 300 x 132 mm, euro size.
- With a 360° rotation elbow, two-meter hose and a compact two stage hand pump with a minimum oil contents of 250 cc, supplied as a complete set in a synthetic storage box, of which dimensions shall not exceed 600 x 400 x 184 mm, euro size.

#### **3.1.13.5 Hydraulic TOE Jack**

It should be Single acting hydraulic tool suitable for lifting heavy vehicles; trams or machines to free victims or objects that are trapped after an accident. The jack should be made of light metal like aluminium so that the unit can be easily carried and placed at the site of operation.

A suitable hand or foot-operated hydraulic pump shall be provided to operate the Toe jack.

The jack shall have a Carrying handle with non-slip coating. The Plunger shall be made of heat-treated high alloy steel and should be nickel-plated. The Cylinder shall be made of high-grade anodized aluminium.

The base and toe shall be made out of heat-treated high alloy steel and shall be replaceable.

#### **Specifications**

- |                                    |                         |
|------------------------------------|-------------------------|
| ➤ max. centric force on the saddle | : not less than 11 tons |
| ➤ max. force on toe                | : not less than 9 tons  |
| ➤ closed height                    | : not less than 440 mm  |
| ➤ extended height                  | : not less than 685 mm  |
| ➤ weight                           | : not more than 21 kg   |



## 3.2 Hydraulic Rescue Tools (Medium/ Light)

Approximate Cost: ₹15 Lakhs

### 3.2.1 GENERAL REQUIREMENT

- The Hydraulic Rescue tools shall be portable and light-weight, and shall be suitable to use by one man.
- The Hydraulic Rescue tools shall be supplied in set form, consist of main equipment like spreader, cutter, telescopic ram and hoses, power pack or hand pump along with all the accessories.
- The Hydraulic Rescue tools and its accessories shall comply with all the requirements stipulated under EN 13204 or equivalent national/ international standards.
- For the safety of the operators, victims and bystanders, the tools shall be powered by non-toxic, mineral based hydraulic oil. Any toxic fluid shall not be used.
- All pressure hoses shall have a safety factor of not less than 4 times the maximum working pressure. All hoses shall be provided with anti kink springs with exception of the non kinking one hose system.
- All tools, hoses and pumps shall be equipped with compact, non-drip quick-connect couplings fast and easy connection. All female couplers shall be equipped with automatic self-locking to prevent accidental disconnecting. Preferably the couplers would have 360 degrees free movement for the easy of uncoiling.
- The hydraulic rescue tools shall be designed to withstand a test pressure of two times their maximum working pressure. Each tool has to be equipped with two internal safety valves for protection against any type of mechanical or hydraulic overload for each cylinder and each tool shall have a separate safety valve for protection against overpressure in case one of the return couplers is disconnected. Moreover, all tools shall be tested for safety according to the American UL requirements (e.g. full load cycle tests) and comply with the European CE safety standards and European Norm. EN 13204
- All hydraulic rescue tools shall be equipped with automatic double pressure check valves to hold any load in any position when the control valve is in neutral position, or in cases of disconnected couplers or sudden pressure drops.
- The cutters, and spreaders shall be provided with a non-slip, U-shaped carrying handle which allows the operator to reposition the tool from one side to the other (left to right and back) without the need to reposition the hand or to release the handle in order to do so. The carrying handle would be mounted in such a way that the tool is fully balanced, even when the tool is picked up with one hand. The position of the carrying handle and the control handle shall allow easy operation for right handed as well as left handed operators.
- Hydraulic rescue tools shall be provided with, double acting hydraulic cylinder with a dead mans type control and shall be able to operate easily with one hand by the operator in any position.
- The tools shall be provided either with two hoses, one for pressure line and another for return line or one coupler allowing a pressure line and return line within one hose. The hoses shall be fitted in the center of the handle to avoid personal harm in case of leakage. The hoses shall allow full 360° rotation and shall be in case of dual hose system equipped with anti-kink springs.

- The tool body, yokes, and spreader arms shall be made out of high quality aluminum alloy for solid construction with low weight. All aluminum alloy parts shall be anodized as a protection against corrosion and scratching. All hinge pins, levers and cutter blades shall be made out of high tensile (heat-treated) tool steel, blackened as protection against corrosion.
- The tools construction shall allow under water use for long periods without the risk of any material damage to any part of the tool.
- All hydraulic tools, pumps, hoses and accessories would be fully operational for longer periods at temperatures of -20 up to + 60° C.
- The tools shall be supplied with proper operation / safety instruction manuals, according to the standards. Operation and safety instructions shall be on the tools and shall be in pictogram style so that they shall be understood by all operators easily.

## TECHNICAL SPECIFICATION OF TOOLS

### 3.2.2 SPREADER

- The spreader shall be double acting hydraulically operated device of lightweight construction made of anti corrosive high strength material capable of being lifted, and operated manually with ease.
- The spreader would be capable of spreading; and pulling with the combination of chains.
- In the tool with two hose system, the tool shall be supplied with connection hoses of min. 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.
- The spreader shall be provided with spreading tips made of fully hardened, high tensile tool steel with proper serrations outside and inside for a perfect grip during spreading as well as squeezing operation. The tips shall be mounted on the spreader arms by means of a quick locking system.
- Pulling adaptors and pulling chains shall be offered as accessories. These accessories shall be quick lock type. The pulling adaptors shall be equipped with shortening hooks, which easily fit in each shackle of the pulling chains to assure quick connection. The pulling chains shall be equipped with the same shortening hooks in order to easily mount the chains to any object of whatever size or shape.

The spreader shall have following specifications:

Spreading distance	Not less than 600 mm
Spreading force measured at 25 mm from the tips as per EN 13204	Not less than 4 T
Spreading force	Not less 30 T
Squeezing force	Not less than 6 T
Pulling distance	Not less than 425 mm
Pulling force with pulling	Not less than 8 T

attachments	
Weight	Not more than 26 kgs

### 3.2.3 CUTTER

- The cutter shall be double acting hydraulically operated device of light weight construction made of anti corrosive high strength material.
- The cutter shall be capable of cutting of various sections such as solid round bar, hollow round bar, flat section, square tube, rectangular tube etc. It would also cut the door pillars of new generation cars.
- In the tool with two hose system the tool shall be supplied with connection hoses of min 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.
- The cutter blade shall be parrot type, the cutting blades shall be of shock resistant non corroding alloy steel, hardened and ground and shall be exchangeable and regrindable. The cutter shall also be able to cut the other various sections as stipulated in EN 13204 category H or equivalent category as per international standards

The cutter shall have following specifications:

Blade opening		Not less than 225 mm
Cutting force		Not less than 35 T
Weight ready for use		Not more than 20 kg
Capable of cutting round steel bar		Not Less than 32 mm
The material of the steel profiles shall conform to EN 10025-1-2000 table 5, type S 235 JR		

### 3.2.4 COMBI TOOL

- The combi tool shall be double acting hydraulically operated of light weight construction made of anti corrosive high strength material.
- The combi tool shall be capable of cutting of various sections such as solid round bar, hollow round bar, flat section, square tube, rectangular tube etc. It would also cut the door pillars of new generation cars.
- In the tool with two hose system the tool shall be supplied with connection hoses of min. 0.4 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose
- The blades shall be of shock resistant non-corroding alloy steel, hardened and ground and shall be exchangeable and regrind able.

The combi tool shall have following specifications:

Spreading Distance	Not less than 250 mm
Spreading force measured at 25 mm from the tips as per EN 13204	Not less than 2.5 T
Spreading force	Not less than 20 T
Cutting force	Not less than 25 T
Squeezing force	Not less than 4.5 T
Pulling distance	Not less than 175 mm
Pulling force	Not less than 6 ton
Weight	Not more than 21 kgs
Capable of cutting round steel bar	Not less than 24 mm
The material of the steel profiles shall conform to EN 10025-1-2000 table 5, type S 235	

### 3.2.5 TELESCOPIC RAM

- The ram cylinder shall be double acting hydraulically operated device of lightweight construction suitable for manual application with ease. The details and design features of the ram and its controls and material used for construction of its major components such as pistons, cylinders and other components shall be given in the offer.
- The telescopic ram shall be capable of lifting and spreading operation.
- In the tool with two hose system, the tool shall be supplied with connection hoses of 0.5 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.

The telescopic ram shall have following specifications

Spreading force 1st plug.	Not less than 20 T
Spreading force 2nd plug.	Not less than 8 T
Length retracted	Not more than 550 mm
Extended Length	Not less than 1250 mm
Weight	Not more than 21 kgs

### 3.2.6 RESCUE RAM

- The ram cylinder shall be double acting hydraulically operated device of light weight construction suitable for manual application with ease.
- The ram shall be capable of lifting and spreading operation.

- In the tool with two hose system the tool shall be supplied with connection hoses of 0.5 meter long complete with coupling, dust cap and protection springs over total length. The female coupler should be of automatic self-locking system type. In the case of one hose system, a male connector shall be fitted to the tool to connect the hose.

The ram shall have following specifications:

Spreading force	Not less than 12 T
Pulling force	Not less than 5 T
No. of Plungers	2 or 3
Retracted length	Not more than 1000 mm
Extended Length	Not more than 1500 mm
Weight	Not more than 25 kgs

Accessories: All accessories like Flat Base, Wedge Tip, Cross head, Conical tip, etc shall be supplied along with the Ram.

### 3.2.7 HYDRAULIC POWER PACK

- There shall be gasoline engine driven power pack suitable to operate all rescue tools in the delivery program of the supplier.
- This petrol driven hydraulic power pack shall be capable of powering tools, independently and have connection possibility for additional tools. For this purpose, the pump shall be provided with separate connecting valves, incorporating a manually operated pressure release valve. The valve shall have two positions, operation or neutral. Even when under full pressure the release valve would be easy to operate and release the pressure. This arrangement is not applicable for one hose system.
- The hydraulic pump shall be driven by a 4-cycle, single cylinder, air-cooled petrol engine. The power of the engine shall be sufficient to drive the hydraulic pump to give output sufficient to operate the two tools simultaneously without reduction in the speed.
- The petrol tank capacity shall be such that, it allows the engine to run for minimum one hour when the tools are continuous operation.
- The starting system of the engine shall be hand recoil type and the starting rope shall wound automatically in when released.
- The engine and the pump shall be mounted on suitable tubular carrying frame with integrated carrying handle.
- The noise level of the power pack when the engine is running shall not be more than 86 dB.
- There shall be means to find out the quantity of fuel and hydraulic oil in the power pack, and same shall be easily accessible visible means have preference. The provision shall also be made to refill the petrol and hydraulic oil through wide filling opening which shall be covered with threaded cap.
- All the hot parts of the power pack shall be properly shielded to avoid possibility of injury to the operator.

- All the controls on the power pack shall be easily accessible and properly labeled in English language.
- The weight of the power pack shall not be more than 35 kg
- The power pack shall be provided with 2 x 2 stage radial piston pump with a minimum output of 2400 cc/min per valve in the first stage and at least 600 cc/min per valve in the second stage. Each pump shall be provided with an automatic changeover valve that switches the first stage output to no load to assure the high output in first stage and second stage. Each pump shall be protected with two internal safety valves, factory set at a suitable maximum pressure.
- The usable oil capacity of hydraulic oil tank shall be minimum 3,6 liters to supply the sufficient quantity of oil to two tools simultaneously with ample reserve capacity for the re-circulation of oil to avoid the overheating in prolonged operation.

The specifications are given below:-

Engine	Petrol engine
Capacity oil tank (effective)	Not less than 3.6 liters
Pump type	2 stage radial pump
Weight	Not more than 35 kgs
No. of tools connected	Two
No. of tools to be operated simultaneously	Two

### 3.2.8 MANUAL HAND/ FOOT PUMP

- A lightweight hydraulic hand / foot pump mounted on suitable base plate shall be offered as a standby unit for power pack to operate the tools.
- It shall be capable of developing adequate pressure for operating all the tools including the telescopic ram up to their full capacity. It shall be possible to operate the pump even when placed in an inclined/vertical position.
- The pump shall have two-stage operation for low & high pressure.

### 3.2.9 HOSES

- There shall be 2 x a pair of high quality 'Thermo Plastic' hose of 5 meters. in length for pressure and return line with quick connect male and female couplings suitable to connect power pack and tools or one hose system.
- The hoses shall be in two different colors to identify easily. Non-interchangeable hydraulic coupling designed for quick connection/disconnecting shall be provided with dust caps, complete with automatic self-locking system. Not applicable for one hose system.
- The hoses shall have the working pressure suitable for tools and the bursting pressure of the hoses shall be 4 times the working pressure.

### 3.2.10 DOUBLE HOSE REEL

- Light weight high pressure hydraulic hoses of 15 meter. long with quick coupler
- The hoses shall be made of thermoplastic material and shall have safety ratio of 1:4

- The hose reel shall be made SS carrying frame & drum for hoses

### 3.2.11 PNEUMATIC LIFTING BAGS

High pressure pneumatic lifting bags, working pressure 8 bar, made of Kevlar reinforced nitrile rubber with 3 layers aramide reinforcement, non slip design, capable of being interlocked when 2 bags are placed on top of each other, quick connection with automatic double locking system, centering cross on both sides, reflecting labels, CE-icons for safety insertion thickness not more than 25 mm including profile, resistant to ozone and range of chemicals etc of the following capacities:-

Lifting capacity	Min. Inflation height (mm)	Min dimensions (mm)	Weight (not more than) kg	Quantity
10 tons	200	375 x 375	4	1 no
20 tons	275	500 X 500	7	2 no
40 tons	400	700 x 700	16	2 no
60 tons	500	900 x 900	25	1 no

The lifting capacities up to +25% shall be acceptable.

The airbags are to be supplied with the following accessories:

Pressure reducer 300 bar to 8 bar	2 nos
Control box for operating 2 airbags with pressure gauges ad carrying strap	2 nos.
Single control unit	2 nos
Air Hose 5 meters	2 nos
Air hose 10 meters	2 nos
Shut off hose with safety valve	4 nos

### 3.2.12 SINGLE ACTING COMPACT HYDRAULIC DOOR OPENER

- The door opener shall be hydraulically operated with two toes, one fixed and one moving and it shall be suitable to force open doors of building that open to the inside and that can be reinforced or blocked.
- The spreading force shall be 90 kN [9,2 ton].
- The door opener shall be single acting, spring return type, driven by hand - or foot pump, working on non - toxic mineral based hydraulic oil.
- The insertion height up to the first groove shall not be more than 3mm, whilst the stroke length of the door opener shall not be less than 128 mm.
- The back of the fixed toe shall be designed with a flat face to be used a hammering base. The door opener must be available with a carrying and positioning handle that automatically keeps the tool from twisting when positioning the tools. The carrying and positioning handle would be finished with a black epoxy layer for optimal grip.



- The door opener must be available with a swivel connection that must be mounted on the back of the tool for optimal maneuverability of the tool and hydraulic connection hose.
- Dimension of the tool shall be [l X w X h] 300 X 120 X 105 mm approx. & weight would not be more than 7 kg.
- The door opener shall be supplied with the accessories such as 30 cm pigtail hose and quick coupler, that can also fitted with the additional positioning & carrying handle with a 360 degree rotation elbow, 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box.
- The door opener shall be able to operate by two stage hand pump.

### **3.2.13 SHORING SYSTEM FOR URBAN SEARCH AND RESCUE COMPRISING OF-**

- 1 no. Struts with air cylinder retracted length not less than 625mm
- 1 no. Struts with air cylinder retracted length not less than 1000mm
- 1 no. Struts with Hydraulic cylinder retracted length not less than 625mm
- 1 no. Struts with Hydraulic cylinder retracted length not less than 1000mm
- 1 nos. Mechanical strut retracted length not less than 225mm
- 1 nos. Mechanical strut retracted length not less than 550mm
- 2 nos. Hand Pump for operating struts with hydraulic cylinders
- 8 nos. Extension pipe 125mm
- 8 nos. Extension pipe 250mm
- 6 nos. Extension pipe 500mm
- 6 nos. Extension pipe 1000mm
- 4 nos. Connector
- 4 nos. Saddle with round surface
- 2 nos. Saddle with flat plate
- 4 nos. Tilting saddle
- 2 nos. Tilting saddle with steel plate
- 2 nos. beam support 150mm
- 4 nos. L support
- 4 nos. Swivel head
- 1 no. V block
- 1 no. V block large
- 2 nos. Cone head
- 2 nos. Cross head
- 2 nos. Support plate
- 2 nos. Tensioning belt
- 2 nos. Adjustable Hook Wrench

**Accessories for Struts with Air cylinder**

- 2 nos. Double control unit
- 2 nos. Pressure reducer
- 2 nos. hose 5 Meters. Each
- 2 nos. hose 10 Meters. each.

**3.2.13.1 Glass Breaker (Punch)**

Glasscutter for cutting laminated glass Inclusive of window punch Inclusive special device to punch first hole in glass Inclusive special device to break side windows on top Max. weight: 1 kg

**3.2.13.2 Leak Sealing Set**

Tank sealing set with high chemical resistance consisting of:

- 1x sealing plate with dimensions of min. 465 x 465 x 30 mm
- 1x harness
- 1x shut-off hose, set at 1,5 bar
- 2x ratchet belt of 10 m length
- To be used together with high pressure lifting bag:
- Reinforced with aramide with light reflecting labels on 3 corners on top side for better visibility in dark environment
- Resistant to chemicals
- Working pressure: max. 1,5 bar

**3.2.13.3 Hydraulic Pedal Cutter**

The cutter shall have straight blades, one fixed and one moving, with a cutting force of at least 75 kN (7.7 ton). It shall be suitable to cut metal parts like car pedals, steering wheels, seat frames etc. The cutter shall be of the single acting, spring return type, driven by a hand- or foot pump, working on non-toxic mineral-based hydraulic oil. The opening in the jaw shall be at least 40 mm, whilst the width of the jaw shall be no more than 40 mm to use the cutter in confined spaces.

**Accessories**

The cutter shall alternatively be supplied in the following executions:

- With a quick coupler directly mounted on the bottom of the cutter.
- With a 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box, of which the dimensions shall not exceed (l x w x h) 400 x 300 x 132 mm, euro size.
- With a 360° rotation elbow, 30 cm pigtail hose and quick coupler, supplied in a synthetic storage box, of which the dimensions shall not exceed 400 x 300 x 132 mm, euro size.
- With a 360° rotation elbow, two-meter hose and a compact two stage hand pump with a minimum oil contents of 250 cc, supplied as a complete set in a synthetic storage box, of which dimensions shall not exceed 600 x 400 x 184 mm, euro size.

### 3.2.13.4 Hydraulic TOE Jack

- It should be Single acting hydraulic tool suitable for lifting heavy vehicles; trams or machines to free victims or objects that are trapped after an accident. The jack should be made of light metal like aluminium so that the unit can be easily carried and placed at the site of operation.
- A suitable hand or foot-operated hydraulic pump shall be provided to operate the Toe jack. The jack shall have a Carrying handle with non-slip coating. The Plunger shall be made of heat-treated high alloy steel and should be nickel-plated. The Cylinder shall be made of high-grade anodized aluminium.
- The base and toe shall be made out of heat-treated high alloy steel and shall be replaceable.

#### Specifications

- max. centric force on the saddle : not less than 11 tons
- max. force on toe : not less than 9 tons
- closed height : not less than 440 mm
- extended height : not less than 685 mm
- weight : not more than 21 kg

## 3.3 Combi Tool (Hand Operated)

Approximate Cost: Rs. 2.5 Lakhs

### 3.3.1 GENERAL SPECIFICATION

The combi tool shall be designed for spreading, cutting during Rescue Operation.

- The rescue combi tool shall be self-contained device with integrated hand pump.
- It shall be hydraulically operated, lightweight and capable of being operated by one person.
- The operating system shall have the best ergonomics of functioning. The "Tool Head" or the Handle shall be rotatable at min. 180 deg in any direction (effectively 360 degrees in both direction) It should have a Self-Locking or manual locking system.
- The rescue tool shall be independent from any outside power source and be operated only by a hand lever integrated in the tool itself. The operation shall be extremely user friendly possible by the same person who holds the tool.
- The head or the handle of the rescue tool should rotate 180 deg in any direction (effectively 360 degrees in both directions) and should be locked in any desired position.
- Minimum spreading force at the tips in closed position shall not be less than 2.5 tons. Maximum spreading force shall not be less than 12 tons.
- Spreading distance at the tips shall not be less than 255 mm.
- The tool shall be capable of Cutting (in the blade recess) not less than 22 mm steel bars
- The maximum cutting force shall not be less than 200 KN
- Weight of ready to use unit should not be more than 12 kg.
- The blades shall be of impact free cutting design to overcome the flying of metal pieces during cutting process.

- The blades shall be able to bite firmly into the work piece and resist any tendency for it to slide forward under the cutting action.
- The blades of the tool shall be made of drop forged tooling steel and must be one piece without loose parts.
- The tips of the blade arms must be serrated inside and outside for firm grip during spreading or squeezing.
- The tool shall be capable of working under extreme conditions, high dusty environment, high humidity & a temperature range from – 15 Deg C to + 70 Deg C. The tool shall be capable of working also in under water conditions up to a depth of approx 40 mtr.

### 3.4 Electric Powered Chain Saw for Wood

Approximate Cost: Rs. 0.5 Lakh

#### 3.4.1 GENERAL SPECIFICATION

<b>Material of Construction:</b> Motor body and Gear Box should be made of Heavy Duty Die Cast Aluminum for Sturdy Design
<b>Motor:</b> Single Phase Insulation resistance more than 500Mohm. High Voltage bearing capacity of 1 K.V. for 1 minute. Power 2000 watt
<b>Voltage:</b> 220 Volt
<b>Current:</b> Minimum 10 Amps.
<b>Spindle Speed:</b> Around 7500 RPM (approx.)
<b>Guide Bar:</b> minimum 60 CMs , Replaceable sprocket nose, .063" gauge
<b>Chain:</b> 0.404"Pitch, gauge .063" , Blued Cutters (for improved strength & superior corrosion resistance) , Lubrilink (for better lubrication) Material : Steel OCS-01
<b>Chain Wheel:</b> 7 Teeth Spur Wheel
<b>Weight:</b> Not exceeding 12 KG.
<b>Cutting Capacity:</b> minimum 150 CM (Circumference)
<b>Chain Lubrication:</b> Built in Piston Type Pump
<b>Chain tensioning:</b> Easy Screw & nut type system
<b>Cutting Rate:</b> minimum 300 Sq. Inch /Min.
<b>Dimensions :</b> 44 inches x 9 inches x 10 inches (approx)
<b>Application :</b> To cut tree, branches, logs and wood in any form namely plank. beam, door, window etc

### 3.5 Petrol Powered Chain Saw for Wood (Large)

Approximate Cost: Rs. 0.5 Lakh

#### 3.5.1 GENERAL SPECIFICATION

Parameter	Specifications
Petrol Engine	Air Cooled 2 Stroke, Single Cylinder
Displacement	70 to 75 Cc
Bar Length	58 to 63 Cm
Weight (Drive Head)	Not exceeding 7.0 Kg.
Fuel Tank	Minimum 700 ML
Oil Tank	Minimum 350 ML
Carburetor	Diaphragm Type
Chain Lubrication	Automatic Oil Pump
Magneto	Flywheel Magneto, CDI Igniter
Starter	Recoil Starter
Idle Rpm	2700± 500
Rated Power	3.8 to 4.5 KW
Max Chain Speed	Around 21 Mt./Sec
Other Devices	Front Hand Guard, Throttle Trigger Lock, Chain Catcher, Chain Brake, Anti-Vibration Device, Spiked Bumper.
Application	To cut large tree, branches, logs and wood in any form namely plank, door, window, beam etc.

### 3.6 Petrol Powered Chain Saw for Wood (Medium)

Approximate Cost: Rs. 0.5 Lakh

#### 3.6.1 GENERAL SPECIFICATION

Parameter	Specifications
Petrol Engine	Air Cooled, 2 Stroke, Single Cylinder
Displacement	50 to 55 CC
Bar Length	48 to 53 Cm
Weight (Drive Head)	Not exceeding 5 Kg
Fuel Tank	Minimum 500 ML
Oil Tank	Minimum 250 MI
Carburetor	Diaphragm Type
Chain Lubrication	Automatic Oil Pump
Magneto	Flywheel Magneto, CDI Igniter
Starter	Recoil Starter
Max RPM	12000 $\pm$ 500
Idle RPM	3800 $\pm$ 500
Rated Power	2.0 to 2.4 KW
Max Chain Speed	Around 23 Mt./Sec
Other features	Front Hand Guard, Throttle Trigger Lock, Chain Catcher, Chain Brake, Anti-Vibration Device, Spiked Bumper.
Application	To cut small tree, branches, logs and wood in any form namely plank, door, window, beam etc.



### 3.7 Petrol Powered Chain Saw for Wood (Small)

Approximate Cost: Rs. 0.5 Lakh

#### 3.7.1 GENERAL SPECIFICATION

Parameter	Specifications
Petrol Engine	Air Cooled, 2 Stroke, Single Cylinder
Displacement	43 to 46 CC
Bar Length	43 cm to 46 Cm
Weight (Drive Head)	Not exceeding 5 Kg.
Fuel Tank	Minimum 500 ML
Oil Tank	Minimum 250 MI
Carburetor	Diaphragm Type
Chain Lubrication	Automatic Oil Pump
Magneto	Flywheel Magneto, CDI Igniter
Starter	Recoil Starter
Max RPM	12000 $\pm$ 500
Idle RPM	3800 $\pm$ 500
Rated Power	1.5 KW to 2.0 KW
Max Chain Speed	Around 20 Mt./Sec
Other features	Front Hand Guard, Throttle Trigger Lock, Chain Catcher, Chain Brake, Anti-Vibration Device, Spiked Bumper.
Application	To cut small tree, branches, logs and wood in any form namely plank, door, window, beam etc.

### **3.8 Petrol Powered Carbide Tipped Chain Saw for Wood**

Approximate Cost: Rs. 0.5 Lakh

#### **3.8.1 GENERAL SPECIFICATION**

Petrol driven Engine: 2-Stroke, Single Cylinder, Air Cooled, Petrol Engine.

Displacement: Minimum 74 cc

Maximum Engine speed: 13000  $\pm$  500 RPM

Carburetor: All position, diaphragm type.

Ignition: Electronically controlled magneto ignition.

Air Filter: Large surfaced air filter.

Clutch: Three shoe centrifugal clutch, rim & drum type drive system.

Fuel Mix Ratio: 25:1 petrol to oil.

Fuel Tank Capacity: Minimum 0.7 Liter

Oil Tank Capacity: Minimum 0.3 Liter

Chain Lubrication: Fully Automatic.

Starting System: Recoiler starter, switch, choke, throttle control lock.

Chain: Carbide Tipped Chain

Guide Bar: minimum 16", slotted for Guard / Depth Gauge.

Guard / Depth Gauge : Guard/depth gauge covers chain, it can be adjusted to set depth of cut

Weight: Not exceeding 11 kg

#### **3.8.2 STANDARD ACCESSORIES:**

a) Toolkit – 1 set

b) Carbide Tipped Chain – 1 pc

c) Wood cutting chain – 1pc

d) Safety Kit : Helmet, Gumboot, Hand Gloves, Spectacles (visor), Hearing Protector (ear muff), Nose Muff, one each.

#### **3.8.3 APPLICATION**

To cut wood, wood with nail, tree, M.S. sheets up to 18 gauges, Aluminum, PVC, FRP, brick etc.

### 3.9 Electric Powered Circular Saw for Concrete

Approximate Cost: Rs. 0.8 Lakh

#### 3.9.1 GENERAL SPECIFICATION

<b>Material of Construction:</b> Motor body and Gear Box should be made of Heavy Duty Die Cast Aluminum for Sturdy Design Wheel Guard – M.S.
<b>Motor:</b> Single Phase
<b>Voltage:</b> 220 Volt
<b>Power:</b> Minimum 2 KW Watts
<b>Current:</b> 10 Amps.
<b>Spindle Speed:</b> Around 5000 RPM
<b>Blade (Cutting Wheel) :</b> 30 CMs diameter. Abrasive wheel for cutting metal, Abrasive wheel for cutting RCC, masonry, brick, stone etc. Diamond Tipped Blade for cutting RCC, masonry bricks, concrete, abrasive material, etc.
<b>Drive System:</b> Belt drive with easy Screw & nut type tension system
<b>Weight:</b> Not exceeding 13 KG.
<b>Cutting Depth:</b> minimum 100 mm
<b>Dimensions :</b> 33 inches x 9 inches x 13 inches (approx)
<b>Cutting Rate:</b> Hard RCC – 10 TO 15 Sq. inch / min Medium RCC – 15 TO 20 Sq. inch / min Masonry, soft stone – 20 TO 30 Sq. inch / min Metal – 2 Sq. inch / min
<b>Application:</b> To cut concrete with reinforced bars (RCC), brick, stone, concrete block, metal sections (bar, angle, channel, plate) and many other building material.

### 3.10 Petrol Powered Circular Saw for Concrete

Approximate Cost: Rs. 0.8 Lakh

#### 3.10.1 GENERAL SPECIFICATION

Engine Type	Air cooled, Two stroke,
	Single Cylinder Petrol Engine
Displacement	Minimum 64 cc
Power	Minimum 2.5 KW
Fuel	Mixed fuel to petrol and 2 stroke oil 4%
Carburetor	All position diaphragm type
Ignition	Electronically controlled magneto ignition
Air filter	Pre filter, Large Main Filter, Auxiliary Filter
Blades (cutting wheel)	300 mm diameter.
	1. Diamond Tipped Blade for cutting RCC, masonry bricks, concrete, abrasive material, etc.
	2. Abrasive wheel for cutting metal.
	3. Abrasive wheel for cutting RCC, masonry bricks, concrete, abrasive material, etc.
Cutting Depth	Minimum 100 mm
Fuel Tank capacity	Minimum 1.5 Liter
Belt tension	Automatic
Dry weight	Not exceeding 13 Kg.
Safety Kit	Consisting of Hand Gloves, Hearing Protector, Nose muffle, Goggle.
Additional Features	Wheel Guard: Quickly adjustable to suit the cutting position.
	Decompression valve: For easy starting.
	Control levers: Throttle trigger, trigger lock and control levers for start, run and stop are combined in the handle for easy operation and control.
	Recoil starter: The rope starter mechanism is shielded against dirt and dust hence avoids frequent maintenance.
Cutting Rate	Hard RCC – 10 TO 15 Sq. inch / min
	Medium RCC – 15 TO 20 Sq. inch / min
	Masonry, soft stone – 20 TO 30 Sq. inch / min
	Metal – 2 Sq. inch / min
Application	To cut concrete with reinforced bars (RCC), brick, stone, concrete block, metal sections (bar, angle, channel, plate) and many other building material.

### 3.11 Petrol Powered Diamond Chain Saw for Concrete

Approximate Cost: Rs. 0.8 Lakh

#### 3.11.1 GENERAL SPECIFICATION

Concrete Cutting Diamond Chain Saw, suitable for cutting Reinforced Concrete up to 300 mm thickness, Self Powered, Petrol driven.

Guide bar 14", Diamond chain 32 segment

Weight not exceeding 13 kg

**ENGINE-** 2 Stroke, Single Cylinder, Air Cooled.

Displacement : 90 to 95 4cc,

Power: Minimum 6.4 HP.

Fuel Tank Capacity: Minimum **one liter**.

It should be specially designed for wet cutting concrete & continuous full load operation

**DIAMOND CHAIN** – Should be designed to cut all types of concrete up to 300 mm thickness with built in iron rod up to 12 mm dia.

#### Cutting Range

a) Hard aggregate and steel : 90 to 150 Sq. cm/min.

b) Medium aggregate : 160 to 185 Sq. cm/ min.

c) Masonry and brick : 180 to 300 Sq. cm/ min.

#### Necessary Accessories

Water Pump coupled with petrol engine.

Suction hose

Foot valve .

Delivery hose: minimum 25 feet with appropriate connections.

Tool kit

Safety kit: Consisting of Spectacles, Hand Gloves, Gum boot, Ear protector, Plastic, Plastic dress, Helmet.

## 3.12 Pneumatic Lifting Bags

Approximate Cost: Rs. 5.0 Lakhs

### 3.12.1 GENERAL SPECIFICATION

- The Pneumatic Lifting Bags should be portable and lightweight, and should be in set form, consisting of bags, hose assemblies, Pressure gauges, pressure reducers, safety valve, Air bottle connector, and controller.
- The Pneumatic Lifting Bags should be in pairs and the lifting capacities should be of 10 ton, 20 ton, 40 ton and 67 ton at 8-bar air pressure. The lifting capacity on higher side by 10% is allowed than the specified loads.
- The Pneumatic Lifting Bags and its accessories should comply with all the requirements stipulated under EN 13731.
- The Pneumatic Lifting Bags should be type tested for artificial aging, 34 bar bursting pressure, dynamic fatigue loading, impact test, impulse loading, drop test, piercing test and abrasion test.
- Each Pneumatic (air) Lifting Bag should be constructed of Kevlar reinforced nitrile rubber with 3 layers aramide reinforcement covering the entire top and bottom surface of each lifting bag.
- Each Pneumatic Lifting Bags should be equipped with a brass valve connection 1/8" NPT internal thread and vulcanized into the reinforced corner of bag to which a male connector of quick connect coupling should be threaded in. This male connector should be replaceable if it gets damaged.
- Each Pneumatic Lifting Bags should have a yellow center mark molded into both sides of the lifting bags to centralize the bags when used in multiples. It should have reflective markings on the corners for easy identification when operating in the dark areas.
- The lifting bags should have an inter locking non skid surface molded into each side of the bags. A separate non skid ply which has been vulcanized separately is not acceptable.
- The lifting bags should be of bright fluorescent color for better visibility while working in dark areas and during nighttime. The bags should be provided with a warning and information labels. The information and the warning labels must be in English language and in pictograms for clear understanding. Also it should be marked with date of manufacturer and serial number in such a way that they cannot be erased without damaging the surface. Reflective stickers should be provided on all corners of the bag and a yellow centering cross should be marked in the centre of the bag.
- The insertion height of deflated lifting bag should not be more than 25mm.
- The Pneumatic Lifting Bags should have maximum working pressure of 8 bar and minimum bursting pressure of 32 bar.
- The air bags should be chemical and some ozone resistant with carrying straps attached to 40 and 67 ton bags.
- The Pneumatic Lifting Bags should be able to use in a temp. range of –300 c to + 800 c
- Each set of air bags should be supplied with following accessories

- Dual Dead man controller 8 bar, housed in a plastic housing with pressure gauge, pressure relief value, and quick connect couplings. This controller should be suitable to inflate two bags at a time.
- Pressure regulator 200/300 bar with finger tight connector and 2 meters Hose with couplings
- Inflation hoses should be of polyester or thermo plastic of 10 meter length 2 nos. Red and Yellow color with suitable couplings to both side to connect Dead man controller and air bags.
- Shut-off hose with safety valve..

### 3.12.2 TECHNICAL SPECIFICATIONS OF AIR BAGS

#### 3.12.2.1 20 Ton Capacity

- Working Pressure : 8 bar
- Capacity (min) : 20 ton
- Insertion height : max. 25mm
- Lifting height : min. 275mm
- Dimensions : Approx 550 X 650mm
- Weight : Approx 8kgs

#### 3.12.2.2 40 Ton Capacity

- Working Pressure : 8 bar
- Capacity (min) : 40 ton
- Insertion height : max. 25mm
- Lifting height : min. 400mm
- Dimensions : Approx 780 X 780mm
- Weight : Approx 16kgs

### 3.12.3 PRESSURE REGULATOR

- The pressure Regulator should be capable of reducing the pressure from 300 bar to 8 bar.
- The pressure regulator should be provided with threaded quick connect couplings suitable to fit to normal BA air cylinder by hand without the use of any spanner. The pressure regulator should be provided with two pressure gauges of suitable capacity to show the air pressure in the cylinder and set pressure. The pressure regulator should be provided with pressure setting knob and safety valve with 2 meters. hose with couplings to connect to Dual Dead man controller.

### 3.12.4 DUAL DEAD-MAN CONTROLLER

- The controller should be suitable to inflate two airlifting bags at a time.
- All the air valves, pressure gauges, pressure relief valve, safety valve should be housed in a ergonomically designed plastic housing of Red/Yellow color. Each control lever should be dead man type and should be capable of being raised, held and lowered by means of control lever.



- The pressure gauge should be provided for individual air outlet line with a Red line set at 8 bar.

### 3.12.5 HOSES

- All the hoses should be equipped with a quick connect/disconnecting male and female couplings, compatible with entire air lifting bag system. The color of hoses should be black/ yellow/ Red.
- The hoses should have minimum working pressure of 16 bar and should be capable of using in temp range of -40 0 C to + 80 0 C .
- The hoses should be either of polyester or thermo plastic material.
- The hoses should be resistant to Ultra Violet Light, change of color, stress or cracking.
- Two shut off hoses with built in safely valve should be provided to release the pressure between 8.5 bar and 10 bar.

One set of airbags will comprise of the following:-

SI	Description	Quantity
1	Lifting Bag 20 tons capacity	2 nos.
2	Lifting Bag 40 tons capacity	2 nos.
3	Pressure reducer 300 bar to 8 bar	2 nos.
4	Dual Controller with pressure gauges	2 nos.
5	Air Hose 5 meters. with couplings	2 nos.
6	Air Hose 10 meters. with couplings	2 nos.
7	Single control Unit	4 nos.
8	Shut off hose with safety valve	4 nos.
9	Connection piece to connect two air cylinder	2 nos.

### 3.12.6 OPERATION AND MAINTENANCE MANUAL

The manufacturer should supply operation and maintenance manual with each set in English language.

### 3.12.7 GUARANTEE

The manufacturer should give the guarantee of min 12 calendar months from the date of supply of goods against any manufacturing defects.

### 3.13 Breathing Apparatus Sets (B. A. Sets)

Approximate Cost: Rs. 0.4 Lakh

#### 3.13.1 GENERAL SPECIFICATION

Sealed quotations are invited for Special Self Contained Breathing Apparatus with 6 ltr 300 bar light-weight steel cylinder with following specifications-

- Should be approved to EN 137: 2006 Type 2 (Flame engulfment tested) suitable for fire-fighting.
- Should have soft padded harness made of flame retardant fabric
- Should have soft padded waist belt for added comfort
- Should have CE marked Face mask approved to EN 136
- Should have Quick-fit connection to the demand valve for quick donning
- Should have Demand Valve hose with quick release coupling connection to the medium pressure hose from Pressure reducer to quick change of demand valve in an emergency without having to remove the set.
- Low cylinder pressure warning device should be position close to the ear of the user above the chest region and in front of the user and it should activate at 55 +/- 5 bar residual cylinder pressure.
- Air loss to atmosphere for warning device operation should not exceed 5 LPM
- The set should be supplied with a 6 liter water capacity with 300 bar filling pressure lightweight steel cylinder
- The cylinder should be approved by PESO (CCE), Nagpur.
- Weight of set with filled cylinder should not exceed 15.5 kg.

#### Accessories

The set should be supplied in complete with:

- Back plate with harness,
- Pressure reducer,
- Full vision face mask
- Demand valve with short hose & QRC.
- Warning device
- 6 ltr. 300 bar lightweight steel cylinder with valve

### **3.14 B. A. Compressor (Portable 100 LPM)**

Approximate Cost: Rs. 1.5 Lakhs

#### **3.14.1 GENERAL SPECIFICATION**

The compressor should be a Fully Imported High Pressure Air Cooled Breathing Air Compressor used for re-filling / re-charging of air cylinders (for SCBA Sets and Water Mist Systems) at a pressure of 200 &/or 300 bar. The compressor will be a multi-stage unit with free air delivery of 100 LPM for standard filling norm 0 to 200 bar. The compressor should be provided with air intake filter, inter coolers, after cooler and final pressure safety valve. Detailed Specifications will be as follows:-

- Free Air Delivery : 100 liters per minute (for standard filling norm)
- Operating Pressure : 300 and 200 Bar
- No. of Stages (Compressor) : 4
- Drive : V. Belt
- Prime Mover : HONDA Make Petrol Engine or Similar brand
- Type of Lubrication : Splash Type.
- Filling Connection : One-Meter long hose with filling adapter for 300 bar (DIN type) with special provision so that it can be used to refill 200 Bar Cylinders (DIN & INT) also.

#### **3.14.2 COMPRESSOR SYSTEM**

The compressor will be a Multi Stage Air-cooled High Pressure Compressor with inter cooler between stages and after-cooler after final stage, safety valve etc. The air should be sucked in via a suction filter to remove dust particles in air and then it should be compressed in the compressor. After compression, the moisture should be separated and air should be filtered in the main filter cartridge to remove all impurities to make it suitable for breathing and water mist systems.

#### **3.14.3 TOOLKIT / OIL AND INSTRUCTIONS**

Necessary tool kit for compressor along with first fill of Oil and Operating manual should be supplied with the compressor.

#### **3.14.4 APPROVALS**

- Compressor manufacturer should be an ISO 9001 certified company
- Air Quality should be as per EN 12021 or equivalent breathing air quality standards

#### **3.14.5 SPARE PARTS/ CONSUMABLE**

1 suction filter element, 2 main filter cartridges and one oil refill to be supplied with the compressor.

#### **3.14.6 WARRANTY**

Compressor should be supplied with warranty against manufacturing defects for 12 months from date of commissioning.

#### **3.14.7 COMMISSIONING SUPPORT AND AFTER SALES SERVICE**

Supplier should be experienced in field of supply of such compressors and should provide free commissioning at site and training of the operators on use & operation of the compressor.

### **3.15 B. A. Compressor (Fully Automatic Filling Station with 250 LPM Free Air Delivery)**

Approximate Cost: Rs. 1.5 Lakhs

#### **3.15.1 GENERAL SPECIFICATION**

The compressor should be a Fully Imported High Pressure Air Cooled Breathing Air Compressor (and NOT packaged in India) used for re-filling / re-charging of air cylinders at a pressure of 200 or 300 bar. The compressor will be a multi-stage unit with free air delivery of 250 LPM for standard filling norm 0 to 200 bar. The machine will be an enclosed type of Filling Station with low noise level. The machine will come with special features of fully enclosed in low noise level canopy, auto stop, auto drain, low oil and high temperature protection, reverse rotation protection. The frame should have adequate mounting for absorbing vibrations. The compressor should be provided with air intake filter, inter coolers, after cooler and safety valve. Detailed Specifications will be as follows:

- Fad/ Capacity : 250 LPM for standard filling norm 0 to 200 bar
- Operation Pressure : 200 to 300 BAR

(User should be able to set any pressure up to 300 bars to fill cylinder at desired pressure using a pressure switch). User should be able to fill cylinders at 200 bar as well as 300 bar using the same compressor.

- Prime Mover : Suitable 3 Phase Electric Motor, 400 V, Within 6 kW, 50Hz.
- Filling Hoses : Two (2) hoses with adapters – One each for 200 & 300 BAR (User should be able to fill 2 cylinders at a time)
- Enclosure : Compressor system to be enclosed in a Low Noise Level CANOPY Machine fully enclosed with noise level < 83 dB as per ISO Std.
- Air Quality : As per EN 12021 standard (suitable for breathing). Certificate from international lab for subject compressor to be provided.

#### **3.15.2 CONTROL PANEL**

The compressor should have following features on the control panel:-

- Start and Stop Switches
- Emergency Stop Switch
- Phase Control Switch to prevent Reverse Rotation
- Inter-Stage Pressure Gauge
- Final Pressure Gauge
- Pressure Switch to set filling pressure and for Automatic Stop so that compressor stops when cylinder filled to desired pressure.
- Hour Meter to show how many hours compressor has run.
- Low Oil Protection to indicate if Oil Level in Compressor is Low. Compressor should shut down / not start if Oil Level is Low.
- High Temperature Protection to shut down the compressor if temperature inside increases beyond set limit.
- Compressor should have suitable facility for Automatic Condensate drain / Discharge which should be collected in a tank for pollution free discharge.

### **3.15.3 COMPRESSOR SYSTEM**

The compressor will be a Multi Stage Air-cooled High Pressure Compressor with inter cooler between stages and after-cooler after final stage, safety valve etc. The air should be sucked in via a suction filter to remove dust particles in air and then it should be compressed in the compressor. After compression, the moisture should be separated and air should be filtered in the main filter cartridge to remove all impurities to make it suitable for breathing. The complete unit will be mounted inside an enclosed canopy for very low sound levels as mentioned above.

### **3.15.4 TOOLKIT / OIL AND INSTRUCTIONS**

Necessary tool kit for compressor along with first fill of Oil and Operating manual should be supplied with the compressor.

### **3.15.5 APPROVALS**

- Compressor manufacturer should be an ISO 9001 certified company
- Air Quality should be as per EN 12021 or DIN 3188 or equivalent breathing air quality standards

### **3.15.6 SPARE PARTS/ CONSUMABLE**

The supplier to provide following consumables for 2 years operation & maintenance of the compressor:-

- Suction Filter elements – 2 Nos.
- Discharge / Main filter cartridges – 4 Nos.
- Oil refill – 2 Refills.

### **3.15.7 WARRANTY**

Compressor should be supplied with warranty against manufacturing defects for 12 months from date of commissioning.

### **3.15.8 COMMISSIONING SUPPORT AND AFTER SALES SERVICE**

Supplier should be experienced in field of supply of such compressors and should provide free commissioning at site and training of the operators on use & operation of the compressor, trouble shooting and normal maintenance of the compressor. The supplier will be responsible for free checkups of the machine during warranty period. Post warranty period, the supplier will have to provide after sales service of all types.

### 3.16 Victim Location Device (Acoustic)

Approximate Cost: Rs. 6.5 Lakhs

#### 3.16.1 GENERAL SPECIFICATION

The equipment is an acoustic listening device, lightweight and easy to carry. Designed especially to detect and locate trapped, live victims in collapsed structure caused by earthquake, explosions, landslides, construction cave-ins or mine disasters. The slightest noise the victim makes should be detected by this device and so the sensitivity is exceptional. It is fitted with an adjustable filter to deaden the effect of dull noises like pneumatic drills, lorries passing.

#### 3.16.2 HOUSING/ AMPLIFIERS & FILTERS

IP66 housing with bar graph for adjustment with IP 68 connectors.

- Two very high gain, low noise amplifiers.
- Two frequency filters "high pass and band pass" infinitely variable, filters activated by 2 keys (the chosen frequency is infinitely variable using the + and - keys)
- Filter 1: "High pass filter" significantly reduces all frequencies below its adjustment point, which may be between 50Hz and 5 kHz which correspond respectively to the low and the high points on the liquid crystal scale. It will eliminate bass sounds such as lorry movements, dull noises...
- Filter 2: "Band pass filter" significantly reduces low and high frequencies on either side of its turning point. It will filter an incoming signal.

#### 3.16.3 SENSORS

- Two ultra-high sensitivity black vibration sensors with 8m of cable
- One white sound sensor fitted with a microphone and a loud speaker with 8m of cable.

#### 3.16.4 HEADSET

One stereo headset with microphone

#### 3.16.5 BATTERIES

- One pack of 6 rechargeable Ni/Mh batteries type LR6/AA (operating life 30h)
- One accumulator charger (usable at 50/60Hz 100v to 240v)
- One cigarette lighter charger plug with wire to be use in a vehicle.

#### Specifications

- Operating temperature: -10° to +60°C
- Storage temperature: -25°to +70°C
- Total weight: 2kg (in use) / 8 kg (with carrying case)

#### 3.16.6 CARRYING CASE

One carrying strap, one shock proof carrying case, dimensions L475 x P415 x H215 mm



### 3.17 Thermal Imaging Camera

Approximate Cost: Rs. 10 Lakhs

#### 3.17.1 GENERAL SPECIFICATION

- The Thermal Imaging Camera shall be hand held and easily transferable between fire fighters without the removal of protective clothing.
- The camera shall remain operational after submersion in water as per IP67 water ingress test.
- The thermal imaging camera should be lightweight weighing less than 800 grams
- The camera shall be of compact and dimensions not exceeding 8 x 6 x 5 inches (LxWxH)
- The camera shall be ergonomically designed and the outer casing be manufactured from Fire retardant tough material like Radel<sup>®</sup>5100 or equivalent

#### 3.17.2 PERFORMANCE

- The camera shall use a detector capable of sensing and imaging infrared in the 8 – 14 micron spectral wavelength range.
- The camera shall use a Amorphous Silicon (ASi) detector of 160 x 120 pixels or higher
- The camera should be automatic in nature without requiring need for adjustments/ focus setting etc
- The camera must have the ability to capture, store and download to a laptop/PC minimum 50 images in viewable format. The end user should be able to save download these images onto a PC by simple connection with a USB port.
- The camera shall have the ability to provide color mode thermal imaging in at least two modes like firefighter color mode and overhaul mode to facilitate prompt and clear detection of fire and heat
- The camera shall have the ability to provide reading for both Spot Temperature as well as live ambient temperature
- The camera shall have the ability to provide digital zoom to x2
- The camera shall have an option for removable germanium lens for long term serviceability and facilitating long life maintenance serviceability
- The Camera should be able to start promptly within 6 seconds
- The camera shall have a single on/off button, with delayed off to prevent
- accidental powering off.
- The camera should be able to operate for a period of 4 (four) hours using standard Ni-MH rechargeable batteries/ Pack or 2 hours using regular AA batteries under nominal conditions
- The camera should be able to show the time and date at the top of the viewing area.
- The camera shall have a minimum 2.5 inch LCD display to allow multi-user viewing.

#### 3.17.3 ACCESSORIES

- The camera shall be supplied with 1 rechargeable NI-MH batteries, 1 AA cell battery pack, Truck mounted battery charger, neck strap, manual and PC interconnection lead as standard.

- The camera will be supplied in a padded, reusable carrying case, which can contain all the accessories supplied with the camera.

#### **3.17.4 WARRANTY**

The camera supplied, including supplied standard accessories, shall be warranted for a minimum of 2 (two) years from date of delivery to the end user.

#### **3.17.5 QUALITY ASSURANCE**

The manufacturer shall be accredited to ISO 9001 to ensure all quality, manufacturing and design systems are being met.

The manufacturer shall be accredited to the Environmental Certification ISO 14001 to maintain all end of use devices are dealt with in the correct manner.

#### **3.17.6 COMPONENTS**

The Thermal Imager Set should be supplied complete with the following:-

a) Thermal Imaging Camera	1
b) Rechargeable Battery Pack	1
c) AA Battery Pack	1
d) Battery Charger 220V AC	1
e) Harness/ shoulder strap	1
f) Instruction Manual	1
g) Carrying Case/ Soft Bag	1

### 3.18 Hand Held Gas Detector Kit

Approximate Cost: Rs. 0.3 Lakh

#### 3.18.1 GENERAL SPECIFICATION

The detector will be a Hand-Held Gas Detector with sensors for simultaneously checking for presence of Oxygen (O<sub>2</sub>), Combustible Gases, Carbon Monoxide (CO) and Hydrogen Sulfide (H<sub>2</sub>S).

- High-contrast LCD showing continuous & simultaneous real-time gas concentrations for all 4 gases.
- High-output 95+ dB Audible alarm at 30cm distance. Visual alarm bars and Internal Vibrator alarm
- It will be tougher and equipped with integral concussion-proof boot for the most rugged environments
- Will have backlight in low light (auto), in alarm (auto) and on demand
- Simple auto zero and auto calibration with diagnostics protection
- Will record and display TWA, STEL and peak exposures to gas on demand
- Has four alarm levels viz. Instant Low and High Alarm for all gases; TWA (Time Weighted Average) and STEL (Short Term Exposure Limit) for H<sub>2</sub>S and CO; OL (Over Limit Alarm) for LEL.
- The power source will be rechargeable battery and supplied with a suitable 220V, 50Hz AC charger. Typical battery run time will be up to 14 hours.
- Continuous LCD will show simultaneous gas concentrations for all gases
- User selectable field options will include; Confidence Beep, Pass Code Protection, Latching Alarms, Calibration Date due advice, Safe Display function, Enable/Disable sensor
- Other features will be full function self-test of: sensor, battery and circuitry integrity; and audible/visual alarms, continuous battery test and instrument status diagnostics
- The detector should have built-in Data Logging and Event Logging facility,
- Instrument should have a water resistant IP 66/67 construction.
- Instrument Dimensions will not exceed 6 x 11 x 4 cm and the detector will weigh less than 175 grams
- Operating & Storage Temperature range will be within -20 °C to +55 °C
- Operating Humidity will be 5% to 95% relative humidity (non-condensing)
- The instrument will have approvals like Intrinsically Safe; Cenelec: EExia d IIC, CE Declared for European Conformity; Australia: Exias IIC for Zone 0; Combustible Gas Performance: ANSI/ISA-S12.13 and CSA C22.2 No. 152. It will also be CCE certified. The quotation will be complete with Specific authorization from manufacturer and copy of any of the approval.
- There should be Two Year Warranty for both instrument & sensors.

Measuring range of the gases will be as under :-

<b>Gas</b>	<b>Method</b>	<b>Measuring Range</b>
	<b>Accuracy/Repeatability</b>	

Combustibles 0.5% CH <sub>4</sub> )	Catalytic	0-100% LEL (or 0-5% CH <sub>4</sub> )	1% LEL (or
Oxygen Vol	Electrochemical	0-30% BY Vol O <sub>2</sub>	0.1 % by
Hydrogen Sulfide	Electrochemical	0-100 ppm H <sub>2</sub> S	1 ppm
Carbon Monoxide	Electrochemical	0-500 ppm CO	1 ppm

### 3.18.2 SCOPE OF SUPPLY

It will include the Four Gas detector for LEL, O<sub>2</sub>, H<sub>2</sub>S and CO in Safety yellow color with integral concussion-proof boot, ready for use complete with charger, alligator belt clip and instructions in English.

### **3.19 Portable Diesel Fire Pump (275 LPM)**

Approximate Cost: Rs. 2.0 Lakhs

#### **3.19.1 GENERAL SPECIFICATION**

These Diesel Fire Pump generally confirm all the specifications as per IS 942 :1982 reaffirmed in 1995

#### **3.19.2 ENGINE**

Single cylinder, four stroke, air cooled, vertical, DI, Diesel engine, developing power of 8 HP at 3600 RPM. Engine should have BIS certificate as per IS 10001:1981 testing and copy of the same is to be submitted along with technical bid . There shall be two options for starting of the engine, Manual recoil rope and Push button battery starting. The battery starting shall also incorporate a high standard alternator.

#### **3.19.3 PUMP**

Should be single stage, centrifugal, Aluminium alloy impeller and pump casing with one each inlet suction of 75 mm and Delivery outlet of 63 mm with screw down valve. The inlet of the pump shall be protected with brass or steel filter to prevent entry of grit and other materials.

#### **3.19.4 PERFORMANCE**

At NTP conditions and 3 meter suction lift. 275 Liters per minute at 4.2 Bar pressure.

#### **3.19.5 PRIMER**

Pump should have engine exhaust ejector type primer (connected to the exhaust of the engine through high temperature resistant materials). It should have capacity to lift the water from a depth of 5 meters within 45 seconds at NTP (normal temperature and pressure) conditions.

#### **3.19.6 FRAMEWORK**

Platform used for the mounting of the pump shall be vibration free, strong and long lasting. The frame shall be of steel. It shall be sturdy, rugged and should have four number handles for easy lifting and transportation. The handles shall be fitted with synthetic or rubberized handgrips. The control panel should be mounted on the framework and comprise of a Delivery Pressure gauge (0 to 10 bars) and Ignition switch.

#### **3.19.7 DIMENSIONS AND WEIGHT**

The following Dimensions and Weight must be adhered for the Portability:-

Dimensions: Length 610 x Width 500 x Height 610 mm

Dry Weight: 90 Kgs along with Battery.

### **3.20 Portable Diesel Multi-purpose Fire Pump (400 LPM)**

Approximate Cost: Rs.2.0 Lakhs

#### **3.20.1 ENGINE**

Single cylinder, four strokes, air-cooled, vertical, DI, Diesel engine, developing power of 8-to10 HP at 3000 to 3600 RPM. Engine should have BIS certificate as per IS 10001:1981 testing. There shall be two options for starting of the engine, Manual recoil rope and Push button battery starting. The battery starting shall also incorporate a high standard alternator.

#### **3.20.2 PUMP**

Should be single stage, centrifugal, Aluminium alloy impeller and pump casing with one each inlet suction of 75mm and Delivery outlet of 63 mm with screw down valve. The inlet of the pump shall be protected with brass or steel filter to prevent entry of grit and other materials.

#### **3.20.3 PERFORMANCE**

At NTP conditions and 1.5 meter suction lift. 400 Liters per minute at 5 Bar pressure.

#### **3.20.4 PRIMER**

Pump should have engine exhaust ejector type primer (connected to the exhaust of the engine through high temperature resistant materials). It should have capacity to lift the water from a depth of 5 meters within 45 seconds at NTP (normal temperature and pressure) conditions.

#### **3.20.5 FRAMEWORK**

Platform used for the mounting of the pump shall be vibration free, strong and long lasting. The frame shall be of M.S. or steel. It shall be sturdy, rugged and should have four number handles for easy lifting and transportation. The handles shall be fitted with synthetic or rubberized handgrips. The control panel should be mounted on the framework and comprise of a Delivery Pressure gauge (0 to 10 bars) and Ignition switch.

#### **3.20.6 DIMENSIONS AND WEIGHT**

The following Dimensions and Weight must be adhered for the Portability:-

Dimensions: Length 610 x Width 500 x Height 610 mm

Dry Weight: 90 Kgs along with Battery.

### **3.21 Portable Diesel Multi-purpose Fire Pump (550 LPM)**

Approximate Cost: Rs.2.0 Lakhs

#### **3.21.1 ENGINE**

Single cylinder, four strokes, air-cooled, vertical, DI, Diesel engine, developing power of 11 HP at 3600 RPM. There shall be two options for starting of the engine, Manual recoil rope and Push button battery starting. The battery starting shall also incorporate a high standard alternator.

#### **3.21.2 PUMP**

Should be single stage, centrifugal, Aluminium alloy impeller and pump casing with one each inlet suction of 100 mm and Delivery outlet of 63 mm with screw down valve. The inlet of the pump shall be protected with brass or steel filter to prevent entry of grit and other materials.

#### **3.21.3 PERFORMANCE**

At NTP conditions and 1.5 meter suction lift. 550 Liters per minute at 5 Bar pressure and 900 Liters per minute at 2 Bar pressure

#### **3.21.4 PRIMER**

Pump should have engine exhaust ejector type primer (connected to the exhaust of the engine through high temperature resistant materials). It should have capacity to lift the water from a depth of 5 meters within 45 seconds at NTP (normal temperature and pressure) conditions.

#### **3.21.5 FRAMEWORK**

Platform used for the mounting of the pump shall be vibration free, strong and long lasting. The frame shall be of steel. It shall be sturdy, rugged and should have four number handles for easy lifting and transportation. The handles shall be fitted with synthetic or rubberized handgrips. The control panel should be mounted on the framework and comprise of a Delivery Pressure gauge (0 to 10 bars) and Ignition switch.

#### **3.21.6 DIMENSIONS AND WEIGHT**

The following Dimensions and Weight must be adhered for the Portability:-

Dimensions: Length 610 x Width 500 x Height 610 mm

Dry Weight: 95 Kgs along with Battery.



## **3.22 Portable Petrol Fire Pump**

Approximate Cost: Rs.2.0 Lakhs

### **3.22.1 ENGINE**

746cc 2 strokes, water-cooled gasoline engine with an output of 55PS (40.5kW)

### **3.22.2 PUMP PERFORMANCE**

2050 liter / min. at 0.6MPa

1800 liter / min. at 0.8MPa

1500 liter / min. at 1.0MPa

### **3.22.3 DRY WEIGHT : 94 KG**

### **3.22.4 PRIMING**

Quick priming is provided by operating Rotary Vane Vacuum Pump.

- Prime 1meter in 4seconds (6m suction hose)
- Prime 3meter in 5.5seconds (6m suction hose)
- Prime 6meter in 8.0seconds (6m suction hose).

### **3.22.5 CENTRALIZED CONTROL**

All gauges, throttle dial, control switches, and other warning lamps are grouped on the control panel for easy operation.

### **3.22.6 OTHER SPECIFICATIONS**

- Engine cooling water is returned to the pump eliminating discharge outside of the pump, and making surrounding area soaked.
- Integrated fuel tank with large capacity of 18liters ensures the fuel supply will last for 1 hour at maximum throttle opening and load.
- 90 degree rotating delivery outlets
- An electric starter and back-up recoil starter are installed to guarantee starting engine under any conditions.
- Equipped with sealed type and maintenance free battery, once the battery is filled with a specified electrolyte, maintenance of electrolyte is not required.

### **3.22.7 ACCESSORIES**

1. Battery charger
2. Floodlight projector
3. Plastic toolbox

### 3.23 Floating Pump

Approximate Cost: Rs.1.0 Lakhs

#### 3.23.1 GENERAL SPECIFICATION

The floating pump should be a lightweight, portable centrifugal pump mounted on an unsinkable, high-strength polyethylene float with dual carrying handles and a splash suppression collar. The pump should be able to operate even in four inches of water. The pump should include an automatic recoil starter, a spark arresting muffler, and an engine over speed control switch.

#### 3.23.2 TECHNICAL SPECIFICATIONS

- **Suction:** One with easily removable screen.
- **Discharge:** One.
- **Head:** Should be of Lightweight, high strength, corrosion resistant aluminum alloy.
- **Pump Volute:** Should be High strength aluminum alloy with waterways for maximum performance.
- **Impeller:** Should be of Bronze enclosed type for maximum efficiency
- **Clearance Rings:** Should be bronze clearance ring for minimum clearance, to prevent rubbing, seizing, and alignment problems.
- **Pump Shaft:** The Engine's vertical shaft should serve as pump shaft, protected against corrosion by a bronze sleeve.
- **Shaft Seal:** Should be Self-adjusting, self-lubricated using a special ceramic seat for wear and shock resistance.
- **Priming:** The priming system shall be automatic and shall work without the suction hose.
- **Engine Type:** Air Cooled Single cylinder, two-cycle gasoline capable of developing not less than 8 HP at 7,000 RPM with suitable starting system, air filter, fuel filter etc..
- **Weight –** Not more than 25 kg

### 3.24 Smoke Exhauster/ PPV

Approximate Cost: Rs.1.0 Lakhs

#### 3.24.1 GENERAL SPECIFICATION

It should be portable, high output smoke exhauster, electrically driven (220 V), suitable for use by fire fighters rescue team for both PPV application (for blowing) and well as NPV applications (for smoke ejection / suction) of hazardous gases / smoke in emergency situations.

#### 3.24.2 TECHNICAL SPECIFICATIONS

The exhauster should be of latest technology with following detailed features:-

- The exhauster should be compact in dimension / size and should not measure more than 20" (Height) X 20" (Width) X 15" (Depth) with a tolerance of +/-10% so that it can be easily placed in the fire tender compartment if so required.
- The exhauster unit should be light in weight and weigh less than 25kg
- The Exhauster should have high output airflow of min. 3000 cfm for effective de – smoking operations.
- The fan size should be 16" diameter with many turbo blades to generate strong air – force.
- The electric motor of the Exhauster should be capable of operating at 220 / 230 V, 50 Hz and should be made to International Standards.

#### 3.24.3 SCOPE OF SUPPLY

The Exhauster set will be supplied complete as per scope mentioned below-

- Smoke Exhauster Unit – 01 No.
- 16" Diameter Duct x 15 ft in length – 01 set with duct fitting. The duct should have suitable treatment for conducting static charges to the ground, thereby making it suitable for use even in hazardous locations. It should be having re-enforcements. Should be collapsible.

### 3.25 Personal Protection Equipment (P.P.E.)

Approximate Cost: Rs.2.5 Lakhs

#### 3.25.1 GENERAL SPECIFICATION

The suit should be a MULTI LAYER FIRE SUIT, designed for proximity firefighting, fully imported, in two-piece design, CE Certified / marked meeting the performance requirements of Standard EN-469:2007 having outer layer made of NOMEX. It should consist of Protective Fire Coats and Over-trousers worn by fire fighters to provide protection against occasional flame contact, the transmission of radiant heat and moisture during structural firefighting activities. The Coat and Over-trouser should be supplied as a matched ensemble providing protection to the upper and lower torso including neck, arms to the wrists and legs to the ankles. The Coat and Over-trouser ensemble should be constructed as a multi-layer assembly containing an outer shell, moisture barrier and thermal liner. The Outer shell should be made of inherently flame resistant NOMEX material only. The Moisture barrier should be made of suitable material / membrane with laminated FR fabric. The Thermal Liner should insulate against radiant & convective heat and should be made of heat resistant material quilted to FR fabric.

Garment design features should include a double close front, Velcro fixing device and safety zipper; Throat Safeguard design adjusted by Velcro fixing device; Double Super large pocket on the Jacket and Pants, One Radio Pocket on the Chest and Concealed Paper Pocket between double close fronts; Cuffs should be adjusted by Velcro and with fire proof, water proof and thumb ring design; Extra patches shall be placed to the bottom of the Jacket's arms to increase the movement capacity; F.R. Reflective tape in Yellow/Lime/Green color should be sewn around the cuffs, foot, chest & back part of the Jacket and on the lower part of the Trousers all around as well as on the side; Waist of the trouser should be at least 25 to 30 cm higher than the Jacket's base (for overlap); Elastic girdle and suspenders should be easily opening / lockable type with adjustable clips; Garment should be sewn using Nomex thread.; Color should be Dark or Navy Blue.

#### 3.25.2 ACCESSORIES

The suit should be supplied with following accessories:-

- A pair of Imported Multi Layer FIRE FIGHTER GLOVES with outer shell made of FR material with additional moisture barrier & thermal liner. It will have extra strength & dexterity. It will provide flame and heat resistance, water and chemical resistance, and high resistance to cutting. It will be CE Marked / Certified to meet performance requirements of standard EN-659.
- A pair of Imported FIRE FIGHTER BOOTS made of Flame Retardant Rubber with Steel Toe Cap and Steel Mid Sole (CSA Class 1). Will be Electric Shock Resistant (CSA Omega) and will have a heat and oil resistant anti-slip sole. Will have heavy canvas lining with sponge cushion insole. Will provide ankle protection. Will be 100% Waterproof & have carrying arrangement on top for ease of donning. Boots should be CE Marked / Certified to meet requirements of EN-345-2 & EN-15090:2006 standard.
- A balaclava style Imported KNITTED SOCK HOOD to provide head and neck protection against direct flame contact. Will be made of knitted FR material. It should be CE Marked / Certified to meet requirements of EN-13911 standard.
- An Imported FIRE MAN HELMET – Light-weight and made of Kevlar Shell. It should have an impact liner c/w leather headband, Ratchet dial size adjuster 52-64cm, 2 point chinstrap with snap-clip, a polycarbonate Face Shield such that the visor can be adjusted to any position. The helmet will have a Neck Protector made of FR material and will be CE Certified to meet performance requirements of standard EN-443:2008.

### **3.25.3 SCOPE OF SUPPLY**

The supplier will be in this field for at least 5 years and should have supplied at least 200 suits and accessories all over India. Copies of all EN certificates and authorization letter from manufacturers (in case of a dealer) should be submitted with offer.

### 3.26 Rescue Boat

Approximate Cost: Rs.5.0 Lakhs

#### 3.26.1 GENERAL SPECIFICATION

The specification for rescue Boat with Tiller handle 30 Hp engine is attached below

- Specifications : Length :19 ½'
- Width : 6 ½'
- Height : 2 ½'
- Total Capacity: 10-12 Persons
- Engine Capacity: 9Hp-40Hp , Engine 40 Hp or 30 Hp 2 stroke with remote start
- Boat hull with dash board and nonskid type floor board
- 02 nos Fiberglass Side Benchers
- Stainless Steel Foldable canopy with cloth
- Lifejacket for the Rescue Team member and victim for rescue operation– CE /US coast Guard Approved/ UL approved.PFD III.

*Disclaimer: The cost of the above equipment has been taken in consultation with M.H.A. and leading specialized firefighting equipment suppliers. It may please be noted that the specifications and cost of these specialized equipment may vary.*

### 3.27 Fire Boat

Approximate Cost: Rs.15.0 Lakhs

#### 3.27.1 GENERAL SPECIFICATION

Due to limitations in approach by ground based firefighting equipments, it is desirable to have fire boat positioned at major inland water bodies like lakes etc sometimes surrounded by human settlements clusters e.g. Dal Lake in Jammu and Kashmir, Loktak Lake in Manipur. The specification for a fire Boat for such firefighting and rescue activity is mentioned below:

- Specifications: Length: 5 – 6 m.
- Total Capacity: 6 - 8 Persons
- Engine Capacity: OBM 60 HP, 2 Stroke Engine with remote start
- 02 nos Fiberglass Side Benchers
- Floating pump/ portable pump

All standard accessories including life jacket for the Rescue Team member and victim for rescue operation.

*Disclaimer: The cost of the above equipment has been taken in consultation with M.H.A. and leading specialized firefighting equipment suppliers. It may please be noted that the specifications and cost of these specialized equipment may vary.*



### 3.28 First Aid Box

Approximate Cost: Rs.0.1 Lakh

#### 3.28.1 GENERAL SPECIFICATION

- Emergency First Aid Guide
- Large Universal Dressing (2)
- Triangular Bandages 110cm x 110cm (2)
- Crepe Bandage 5cm (1)
- Crepe Bandage 7.5cm (1)
- Crepe Bandage 15cm (1)
- Heavy Crepe 10cm (1)
- Combine Pads 20cm x 30cm (2)
- Combine Pads 10cm x 10cm (2)
- Conforming bandage – 5cm x 1.5m (2)
- Conforming bandage – 7.5cm x 1.5m (2)
- Wound Dressing No. 14 (1)
- Non-adherent Pad 7.5 x 10cm (4)
- Non-adherent Pad 7.5 x 20cm (2)
- Burns Sheet Small (1)
- Bag Adhesive Strips (Bag of 50) (1)
- Antiseptic Swabs (8)
- Alcohol Swabs (3)
- Bag Antiseptic Steritube (Bag of 2) (1)
- Eye Pads Large (2)
- Saline Steritube 15ml (4)
- Saline Steritube 30ml (2)
- Sterile wound dressing – No. 13 (2)
- Sterile wound dressing – No. 15 (2)
- Fabric strips (pk 50) (1)
- Antiseptic wipes (pk 10) (1)
- Hypo-Allergenic Tape 2.5cm x 9m (1)
- Bag Safety Pins (Bag of 12) (1)
- Pkt Disposable Splinter Probes (Pkt of 5) (1)
- Stainless Steel Sharp Forceps 12.5cm (1)
- Stainless Steel Sharp/Blunt Scissors 12.5cm (1)

- Emergency Shock Blanket (1)
- Pkt Paracetamol Tablets (Pkt of 12) (1)
- Stopitch 50g (1)
- Bag Disposable Nitrile Gloves (Bag of 2) (1)
- UP Sunscreen Tube 30+ 100g (1)
- Disposable Resuscomask (1)
- Sterile Gauze Swabs 7.5cm x 7.5cm (3)
- Bag Disposable Towels (Bag of 3) (1)
- Skin Closure 5 (2)
- Cetrimide 30ml Antiseptic (4)
- 12.5cm S/S Blunt Sharp Scissors (1)
- Disposable goggles – clear (1)
- Instant cold pack – disposable (1)
- Antiseptic Soap (1)
- Plastic Kidney Dish (1)
- 12.5cm S/S Forceps (1)
- Forceps plastic (2)
- Plastic Bag Medium (1)
- Biohazard waste bag – yellow (large) (1)
- Notepad & pencil in bag (1)

### 3.29 Underwater Diving Suit – Dry Type

Approximate Cost: Rs.4.0 Lakhs

#### 3.29.1 GENERAL SPECIFICATION

The dive suit will be a Dry Dive Suit for excellent performance & total comfort when making dives. The suit (in one piece design) will be made in 5 mm soft pre-compressed neoprene double lining and will have Incorporated Boots with rigid non-slip soles and reinforced kneepads. There will be an attached neoprene hood for the suit and special smooth 5 mm wrist and 3 mm roll neck seals in neoprene to prevent water from seeping in or out.

A watertight zipper will run along the back from elbow to elbow. The suit will have an automatic/manual dumping system and a rapid inflation valve. The suit will come with a hose for connecting the inflation valve to the 2nd stage of the regulator (for inflation using air from the cylinder of the underwater BA Set). It should be supplied complete with a pair of five-fingered heat reflecting Gloves with 3 mm neoprene double lining.

Another accessory included shall be a pair of Diving Fins with adjustable strap / buckle. The fins shall be made of EVA Rubber in a highly hydrodynamic design with Thrust Surface of at least 700 square cm. The fins should be lightweight and weigh less than 800~850 grams out of water. Scope will also include a WEIGHT BELT with SS buckle and 2 Nos. 2 kg “H” type LEAD WEIGHTS.

### **3.30 Underwater Diving Suit – Wet Type**

Approximate Cost: Rs.2.0 Lakhs

#### **3.30.1 GENERAL SPECIFICATION**

The dive suit will be a Wet Dive Suit in heat-reflecting 5 mm neoprene. It will come in a two-piece design viz. Legging (Farmer John) and Jacket with attached hood closed by a convenient face zipper or a one-piece design overall with attached Hood and zipper at front. Wrist, ankle and face seals will be watertight.

The suit will be supplied complete with a pair of five-fingered heat reflecting Gloves with 3 mm neoprene double lining. The suit will also be supplied with a pair of Boots, which are comfortable & heat reflecting with 5 mm neoprene lining, non-slip soles and nylon side zipper.

Another accessory included shall be a pair of Diving Fins with adjustable strap / buckle. The fins shall be made of EVA Rubber in a highly hydrodynamic design with Thrust Surface of at least 700 square cm. The fins should be lightweight and weigh less than 800~850 grams out of water. Scope will also include a WEIGHT BELT with SS buckle and 2 Nos. 2 kg “H” type LEAD WEIGHTS.

### 3.31 Inflatable Lighting Tower

Approximate Cost: Rs.2.1 Lakhs

#### 3.31.1 GENERAL SPECIFICATION

- Base Frame: It shall consist of MS tube frame and a base plate of aluminium sheet of 3mm +10%/-5% thickness to support generating set and control gear box and shall be provided with anti vibration rubber pads. M.S. Parts shall be powder coated.
- Top Cover: Made of molded fiberglass or suitable material designed to fasten the tower balloon by suitable steel strip so that there is no air leakage at the joint. It shall provide suitable nipple for filling air into the balloon and provide support for it to remain erect at wind speed of 45 km/hr.
- Generator Set: Recoil start portable AC Generating set comprising AC Generator rated as 1200VA 240V 1 phase of unit power factor conforming to IS:13364 (Part I/92 and petrol run air cooled four stroke single cylinder engine with resettable circuit breaker in the AC output. Fuel tank capacity should be for continuous running of generating set for 8 hours. A fuel level indicator should be on display panel.
- System should work on 220/240V 50 Hz AC supply and for connecting to the mains shall have provision for 15 Amp 3-pin socket and a suitable lead wire with plugs at both ends.
- Two nos. of compressors/air blowers of suitable rating to be provided to inflate the balloon in 60 sec maximum.
- Balloon: It shall be cylindrical shaped made of suitable polyester based cloth to ensure emission of light with minimum loss and shall be waterproof and strengthened with flexible stiffeners to sustain inside air pressure and to remain erected against outside wind speed of 45km/hr.
- One 400W High Pressure Metal Halide (HPMH) lamp to give 42000 lumens shall be mounted inside the balloon at the top end such that it goes up/down while inflating and deflation. Balloon height in inflated condition shall be 4.5 to 5m from base plate. The length of nylon rope required for the stays should be 5 meter and of 6 mm dia.
- Control Gear shall be suitable designed and fitted with MCB, lamp ballast, igniter, capacitors, changeover and on/off switches with indicating lamps for controlling 1 No.400 W HPMH lamp and two air blowers.

#### 3.31.2 PERFORMANCE

- A minimum lux value of 1 shall be achieved on ground at 55m radius within 5 minutes of starting.
- Deflation time including repacking shall be 5 minutes max.
- The inflated tower only shall be rain proof and shall conform to IP X5 to IS:10322 (Part 1)/82.
- The system shall be continuously run for 8 hours, without damaging/adversely affecting the balloon fabric and other components.

#### 3.31.3 INSPECTION

The requirements at 9(a) (b) and (d) shall constitute acceptance tests and shall be carried out on 10% of the offered lot subject to a minimum of three. Supplier shall possess calibrated equipments for lux measurements. The Accuracy class of lux meter is to be 1%.

#### **3.31.4 DIMENSIONS**

Total weight of complete system: 50 kg. Max. Overall dimensions in deflated condition (nominal): 600 x 450 x 500mm

#### **3.31.5 ACCESSORIES**

- Storage box: Suitably designed to accommodate the tower and other spare easy to handle with proper locking arrangements.
- Rain protection cover: For generating set and control gear box made of waterproof cloth with air vent arrangements.
- Wind Support: 5 meter nylon stay wire ropes of diameter 6 mm (3 Nos.) which can be tied to the tower (balloon) and grouting hooks in case of extra wind velocity.
- Tool Kit: Necessary tools required for operation of the emergency light system viz screw driver, plug spanner and T-nut driver, 3 nos. puncture Tape of the size 10 cm x 10 cm etc.
- One set of following spares to be compulsorily supplied with the equipment.- i) Lamp with requisite control gear. ii) Blower.

#### **3.31.6 OPTIONAL ACCESSORY**

- Trolley: Suitable trolley with wheels to move the erected tower within a reasonable distance with ease.

#### **3.31.7 SCOPE OF SUPPLY**

Suppliers shall furnish complete and satisfactory type test certificates as per above specification to the concerned D(QA) at the time of inspection. The TTC shall be from any Govt. lab.

### **3.32 High Capacity LED Torch**

Approximate Cost: Rs.0.4 Lakhs

#### **3.32.1 GENERAL SPECIFICATION**

- The LED torch cell has high intensity discharge capable of giving high and low light beams.
- The LED torch shall have main bulb and secondary bulb. The main bulb shall be min 50-watt xenon and the secondary bulb shall be 3 watt Luxeon.
- The torch shall be capable of operation for min two hours on high beam and more than 12 hours on low beam.
- Suitable charger shall be provided with the LED torch and the charging indicator shall be available on the torch. Adjustable stand and detachable shoulder strap shall also be provided with the torch.
- The light produced by this torch shall be white and natural light color.
- The battery used in the LED torch shall be Nickel Metal Hydride battery pack (Ni-MH) and of 12 volts 9 A/h. The full charge time shall not be more than 8 hours.
- The weight of the torch including the battery shall not be more than 3 kg



### 3.33 Static Wireless Set

Approximate Cost: Rs.0.27 Lakh

#### 3.33.1 GENERAL SPECIFICATION

Sr. No.	Specification	Qualitative Requirement
<b>General</b>		
1	Frequency Range	136MHz to 174MHz, (Full Band) 400 MHz to 470 MHz (Full Band)
2	Frequency spread	38 MHz
3	Channel Capacity	512 or higher
4	Protocol	TDMA (Open Standard)
5	Channel Spacing	Analog- 12.5 KHz, 25 KHz. Digital – TDMA 12.5 KHz
6	Type of Emission	As per standards, specific to requirement as mentioned in Sr. No. 5 above.
7	Frequency Stability	+/- 1.5 PPM or better
8	Type of Operation	Simplex, Semi-Duplex, Press to Talk
9	Weight	Less than 2 Kg
10	Power Source	13.6 Volt DC +/- 10% with Reverse Polarity Protection
<b>Transmitter</b>		
1	RF Power Output	25 W $\pm$ 0.5 dB, Programmable
2	Frequency Deviation	$\pm$ 2.5 KHz @ 12.5 KHz $\pm$ 5KHz @ 25KHz
3	Modulation Sensitivity	Upto 10mV @ 1 KHz Mic Input for standard deviation <ul style="list-style-type: none"> <li><math>\pm</math> 1.5 KHz (for 12.5 KHz )</li> <li><math>\pm</math>3 KHz (for 25KHz )</li> </ul>
4	Modulation Distortion	Less than 5% @ 1 KHz
5	Modulation Fidelity	+1, -3 dB of 6dB / Octave pre-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
6	FM Hum Noise	40 dB @ 12.5 KHz 45 dB @ 25 KHz
7	Spurious & Harmonics Response	60 dB or better.
<b>Receiver</b>		
1	Sensitivity	Analog – 0.35 $\mu$ V for 12 dB SINAD Digital - 0.3 $\mu$ V @ 5 % BER
2	Adjacent Channel Selectivity	Analog – 60 dB @ 12.5 KHz 70 dB @ 25 KHz Digital - 60 dB
3	Image Rejection	60 dB or better
4	Spurious Rejection	60 dB or better
5	Audio Output	Internal min. 3 Watt

6	Speaker	Front mounted internal speaker and socket for external speaker
7	Audio Response	+1, -3 dB of 6 dB / Octave de-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
8	Hum and Noise	40 dB @ 12.5 KHz 45 dB @ 25 KHz
<b>Environmental Specifications</b>		
1	Operating Temperature Range	-10 ° C to + 55 ° C
2	Applicable MIL Standards	MIL Standard 810 C, D, E and F
3	Applicable IP Standards	IP 54 or better
<b>Features</b>		
1	Mode of operations	Analog, Digital, Mix
2	Ready to GPS	<ul style="list-style-type: none"> <li>• Shall be GPS ready. GPS should be built in.</li> <li>• GPS support with Horizontal accuracy &lt; 10 meters</li> <li>• Necessary Hardware, Software shall be provided that is required for making radios "GPS Ready"</li> </ul>
3	Status message and SMS Text Message Facility	<ul style="list-style-type: none"> <li>• Status messaging facility.</li> <li>• Data Message facility</li> <li>• Messaging Facility using PCs</li> <li>• Necessary Hardware, Software shall be provided for interfacing PC.</li> </ul>
4	Scrambler	<ul style="list-style-type: none"> <li>• In built programmable Scrambler in Analog mode. Encryption in Digital mode.</li> </ul>
5	Protection	<ul style="list-style-type: none"> <li>• Reverse Polarity Protection</li> <li>• Protection against High VSWR</li> </ul>
6	Radio Configuration facility	<ul style="list-style-type: none"> <li>• PC programming</li> </ul>
7	Handset with mic. Key Key pad	DTMF Front Panel Keypad
8	Multifunction LCD Display	Multifunction LCD Display with Backlight
9	Signal Strength Indicator	RSSI – Received Signal Strength Indicator bar.
<b>Other Features</b>		
1	Alpha –Numeric List of 256 Users for sending SMS and for Selective Calling	
2	Alpha –Numeric Channel Alias	
3	Alpha –Numeric PTT ID Alias	
4	Ambience listen feature	
5	Facility to assign Network Access code, CTCSS / Digital CTCSS	
6	Channel Scan ( Analog channel only, Digital channel only and Mixed Scanning	

	between Analog and Digital Channels) .	
7	Call Alert	
8	Talk Around	
9	Transmitter Time Out Timer (TOT) Operation	
10	Emergency Call	
11	Selective Call, Group Call	
12	Radio Check function	
13	Busy Channel Lockout	
14	Remote Kill, Stun and Revive Facility, over the air.	
15	Programmable power on password	
16	Externally accessible accessory connector ( for connecting Programming Kit, Repeater Interface etc. )	
17	Signalling system for Analog conventional mode (DTMF, Select 5/5 Tone,etc. )	
18	Inter Site roaming (along with IP site connect)	
<b>Accessories and Manuals</b>		
1	Type of Antenna	6 dB Omni Directional Antenna with suitable connector and mounting clamps, 30 mtr Co-axial Cable and connectors
1.1	Power Supply Unit Cum Battery Charger	See specifications attached
2	Operating Manual	Hardcopy, one for each Mobile Radio
3	Technical/ Service Manual	Hardcopy and Softcopy in desired quantity
4	Mounting Kit	Mounting Kit
5	Handset (Mic.)	Fist /DTMF Handset With CLIP
6	Battery Cable	Length : 3 meters with suitable FUSE
7	Programming Interface & Software	All necessary Radio Programming Hardware, Cables, Connectors and Software in desired quantity
8	Training	<div>Necessary Technical Training regarding<ul style="list-style-type: none"><li>• Configuring the Mobile Set,</li><li>• Operational,</li><li>• Repairs and Maintenance</li></ul></div>
<b>Notes</b>		
1	Protocol and Signalling Scheme	Mobile Radios, Handheld Radios, Repeaters shall be same in respect of protocol (TDMA), type of emission and signalling scheme etc. and shall be mutually interoperable, so that full functional network can be established using these radios and repeaters.

2	Certificates of Tests	Vendor shall provide the certificates from OEM for each of the parameters of the radios mentioned below: <ol style="list-style-type: none"><li>1. Environmental Specifications and Standard Test as per IS 9000.</li><li>2. Other radio parameters those cannot be tested / verified in the client's lab.</li></ol>
3	Interoperability	Vendor shall mention other manufacturer, Models of the radios which are interoperable with the radios offered.
4	Service and Spare Parts support	Support for Service / Spare Parts – Min. 5 Years and spare availability within four weeks after receipt of supply order.

### 3.34 Mobile Wireless Set

Approximate Cost: Rs.0.17 Lakh

#### 3.34.1 GENERAL SPECIFICATION

Sr. No.	Specification	Qualitative Requirement
<b>General</b>		
1	Frequency Range	136MHz to 174MHz, (Full Band) 400 MHz to 470 MHz (Full Band)
2	Frequency spread	38 MHz
3	Channel Capacity	512 or higher
4	Protocol	TDMA (Open Standard)
5	Channel Spacing	Analog- 12.5 KHz, 25 KHz. Digital – TDMA 12.5 KHz
6	Type of Emission	As per standards, specific to requirement as mentioned in Sr. No. 5 above.
7	Frequency Stability	+/- 1.5 PPM or better
8	Type of Operation	Simplex, Semi-Duplex, Press to Talk
9	Weight	Less than 2 Kg
10	Power Source	13.6 Volt DC +/- 10% with Reverse Polarity Protection
<b>Transmitter</b>		
1	RF Power Output	25 W $\pm$ 0.5 dB, Programmable
2	Frequency Deviation	$\pm$ 2.5 KHz @ 12.5 KHz $\pm$ 5KHz @ 25KHz
3	Modulation Sensitivity	Upto 10mV @ 1 KHz Mic Input for standard deviation <ul style="list-style-type: none"> <li><math>\pm</math> 1.5 KHz (for 12.5 KHz )</li> <li><math>\pm</math>3 KHz (for 25KHz )</li> </ul>
4	Modulation Distortion	Less than 5% @ 1 KHz
5	Modulation Fidelity	+1, -3 dB of 6dB / Octave pre-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
6	FM Hum Noise	40 dB @ 12.5 KHz 45 dB @ 25 KHz
7	Spurious & Harmonics Response	60 dB or better.
<b>Receiver</b>		
1	Sensitivity	Analog – 0.35 $\mu$ V for 12 dB SINAD Digital - 0.3 $\mu$ V @ 5 % BER
2	Adjacent Channel Selectivity	Analog – 60 dB @ 12.5 KHz 70 dB @ 25 KHz Digital - 60 dB
3	Image Rejection	60 dB or better
4	Spurious Rejection	60 dB or better
5	Audio Output	Internal min. 3 Watt
6	Speaker	Front mounted internal speaker and socket for external speaker

7	Audio Response	+1, -3 dB of 6 dB / Octave de-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
8	Hum and Noise	40 dB @ 12.5 KHz 45 dB @ 25 KHz
<b>Environmental Specifications</b>		
1	Operating Temperature Range	-10 ° C to + 55 ° C
2	Applicable MIL Standards	MIL Standard 810 C, D, E and F
3	Applicable IP Standards	IP 54 or better
<b>Features</b>		
1	Mode of operations	Analog, Digital, Mix
2	Ready to GPS	<ul style="list-style-type: none"> <li>• Shall be GPS ready. GPS should be built in.</li> <li>• GPS support with Horizontal accuracy &lt; 10 meters</li> <li>• Necessary Hardware, Software shall be provided that is required for making radios “GPS Ready”</li> </ul>
3	Status message and SMS Text Message Facility	<ul style="list-style-type: none"> <li>• Status messaging facility.</li> <li>• Data Message facility</li> <li>• Messaging Facility using PCs</li> <li>• Necessary Hardware, Software shall be provided for interfacing PC.</li> </ul>
4	Scrambler	<ul style="list-style-type: none"> <li>• In built programmable Scrambler in Analog mode. Encryption in Digital mode.</li> </ul>
5	Protection	<ul style="list-style-type: none"> <li>• Reverse Polarity Protection</li> <li>• Protection against High VSWR</li> </ul>
6	Radio Configuration facility	<ul style="list-style-type: none"> <li>• PC programming</li> </ul>
7	Handset with mic. Key Key pad	DTMF Front Panel Keypad
8	Multifunction LCD Display	Multifunction LCD Display with Backlight
9	Signal Strength Indicator	RSSI – Received Signal Strength Indicator bar.
<b>Other Features</b>		
1	Alpha –Numeric List of 256 Users for sending SMS and for Selective Calling	
2	Alpha –Numeric Channel Alias	
3	Alpha –Numeric PTT ID Alias	
4	Ambience listen feature	
5	Facility to assign Network Access code, CTCSS / Digital CTCSS	
6	Channel Scan ( Analog channel only, Digital channel only and Mixed Scanning between Analog and Digital Channels) .	
7	Call Alert	
8	Talk Around	
9	Transmitter Time Out Timer (TOT) Operation	

10	Emergency Call	
11	Selective Call, Group Call	
12	Radio Check function	
13	Busy Channel Lockout	
14	Remote Kill, Stun and Revive Facility, over the air.	
15	Programmable power on password	
16	Externally accessible accessory connector ( for connecting Programming Kit, Repeater Interface etc. )	
17	Signalling system for Analog conventional mode (DTMF, Select 5/5 Tone,etc. )	
18	Inter Site roaming (along with IP site connect)	
<b>Accessories and Manuals</b>		
1	Type of Antenna	3 dB Whip Antenna with suitable connector, 3 mtr Co-axial Cable and mounting bracket
2	Operating Manual	Hardcopy, one for each Mobile Radio
3	Technical/ Service Manual	Hardcopy and Softcopy in desired quantity
4	Mounting Kit	Mounting Kit
5	Handset (Mic.)	Fist /DTMF Handset With CLIP
6	Battery Cable	Length : 3 meters with suitable FUSE
7	Programming Interface & Software	All necessary Radio Programming Hardware, Cables, Connectors and Software in desired quantity
8	Training	<div>Necessary Technical Training regarding<ul style="list-style-type: none"><li>• Configuring the Mobile Set,</li><li>• Operational,</li><li>• Repairs and Maintenance</li></ul></div>
<b>Notes</b>		
1	Protocol and Signalling Scheme	Mobile Radios, Handheld Radios, Repeaters shall be same in respect of protocol (TDMA), type of emission and signalling scheme etc. and shall be mutually interoperable, so that full functional network can be established using these radios and repeaters.
2	Certificates of Tests	<div>Vendor shall provide the certificates from OEM for each of the parameters of the radios mentioned below:<ul style="list-style-type: none"><li>3. Environmental Specifications and Standard Test as per IS 9000.</li><li>4. Other radio parameters those cannot be tested / verified in the client's lab.</li></ul></div>
3	Interoperability	Vendor shall mention other manufacturer, Models of the radios which are interoperable with the radios offered.

4	Service and Spare Parts support	Support for Service / Spare Parts – Min. 5 Years and spare availability within four weeks after receipt of supply order.



### 3.35 Walky-Talky Set

Approximate Cost: Rs.0.12 Lakh

#### 3.35.1 GENERAL SPECIFICATION

Sr. No.	Specification	Qualitative Requirement
<b>General</b>		
1	Frequency Range	136MHz to 174MHz, (Full Band) 400 MH to 470 MHz
2	Frequency spread	38 MHz
3	Channel Capacity	512 or higher
4	Protocol	TDMA (Open Standard)
5	Channel Spacing	Analog- 12.5 KHz, 25 KHz. Digital – TDMA 12.5 KHz
6	Type of Emission	As per standards, specific to requirement as mentioned in Sr. No. 5 above.
7	Frequency Stability	+/- 1.5 PPM or better
8	Type of Operation	Simplex, Semi-Duplex, Press to Talk
9	Weight	Less than 450 gms.
10	Power Source	Li-Ion/ Li-polymer Battery Pack of 2000 mAH or more (Vendor shall mention DC Voltage )
<b>Transmitter</b>		
1	RF Power Output	<ul style="list-style-type: none"> <li>Low : 1 Watt &amp; High : 5 Watt <math>\pm 0.5</math> dB,</li> <li>Programmable and Switchable</li> </ul>
2	Frequency Deviation	$\pm 2.5$ KHz @ 12.5 KHz Channel Spacing $\pm 5$ KHz @ 25KHz Channel Spacing
3	Modulation Sensitivity	Upto 10mV @ 1 KHz Mic. Input for standard deviation <ul style="list-style-type: none"> <li><math>\pm 1.5</math> KHz (for 12.5 KHz )</li> <li><math>\pm 3</math> KHz (for 25KHz )</li> </ul>
4	Modulation Distortion	Less than 5% @ 1 KHz
5	Modulation Fidelity	+1, -3 dB of 6dB / Octave pre-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
6	FM Hum Noise	40 dB @ 12.5 KHz 45 dB @ 25 KHz
7	Spurious & Harmonics Response	70 dB
<b>Receiver</b>		
1	Sensitivity	Analog – 0.35 $\mu$ V for 12 dB SINAD Digital - 0.3 $\mu$ V @ 5 % BER
2	Adjacent Channel Selectivity	Analog – 60 dB @ 12.5 KHz Channel Spacing 70 dB @ 25 KHz Channel Spacing Digital - 60 dB
3	Image Rejection	60 dB or better
4	Spurious Rejection	70 dB

5	Audio Output	500 mW Typically @ 5 % distortion
6	Audio Response	+1, -3 dB of 6 dB / Octave de-emphasis characteristics from 350 Hz to 2700 Hz or better with 1 KHz as a reference
7	Hum and Noise	40 dB @ 12.5 KHz Channel Spacing 45 dB @ 25 KHz Channel Spacing
<b>Environmental Specifications</b>		
1	Operating Temperature Range	-10 ° C to + 55 ° C
2	Applicable MIL Standards	MIL Standard 810 C, D, E and F
3	Applicable IP Standards	IP 57 or better
<b>Features</b>		
1	Mode of operations	Analog , Digital and Mix Mode.
2	Trunk Mode	Radio should support single site and multisite mode.
3	GPS support	<ul style="list-style-type: none"> <li>• Shall have built in GPS Ready.</li> <li>• GPS support with Horizontal accuracy &lt; 10 meters</li> <li>• Necessary Hardware, Software shall be provided that is required for making radios "GPS Ready"</li> </ul>
4	Status message and SMS Text Message Facility	<ul style="list-style-type: none"> <li>• Status messaging facility.</li> <li>• Data Message facility</li> </ul>
5	Scrambler	<ul style="list-style-type: none"> <li>• In built programmable Encryption Scrambler in Digital mode.</li> <li>• Scrambler in Analog mode.</li> </ul>
6	Protection	<ul style="list-style-type: none"> <li>• Reverse Polarity Protection</li> <li>• Protection against High VSWR</li> </ul>
7	Radio Configuration facility	<ul style="list-style-type: none"> <li>• PC programming</li> </ul>
8	Front Panel Key pad	<ul style="list-style-type: none"> <li>• DTMF Front Panel Keypad with Backlit</li> </ul>
9	Multifunction LCD Display	<ul style="list-style-type: none"> <li>• Multifunction LCD Display with Backlight</li> </ul>
10	Battery Strength Indicator	<ul style="list-style-type: none"> <li>• Battery Strength Bar indicator</li> <li>• Alert for Low Battery</li> </ul>
11	Signal Strength Indicator	RSSI – Received Signal Strength Indicator – Bar
<b>Other Features</b>		
1	Alpha –Numeric List of 256 User for sending SMS and Selective Calling	
2	Alpha –Numeric Channel Alias	
3	Alpha –Numeric PTT ID Alias	
4	Facility for locking the Key pad	

5	Facility to assign Network Access Code, CTCSS/ Digital CTCSS	
6	Channel Scan (Analog channel only, Digital channel only and Mixed scanning between Analog and Digital Channels)	
7	Call Alert	
8	Talk Around	
9	Transmitter Time Out Timer (TOT) Operation	
10	Emergency call facility	
11	Selective Call, Group Call	
12	Radio check function	
13	Busy Channel Lockout	
14	Remote Kill, Stun and Revive Facility, Over the air	
15	Programmable power on password	
16	Suitable Channel selector switch	
17	Signaling system for Analog conventional mode (DTMF, Select 5/5 Tone, etc. )	
18	Capability for Hands free operation VOX	
19	Externally accessible accessory connector ( for connecting Hands free accessory Kit/ Programming Kit etc. )	
20	Ambience listen feature	
<b>Accessories and Manuals</b>		
1	Type of Antenna	Rugged flexible Helical Antenna for the specified frequency band.
2	Battery	<ul style="list-style-type: none"><li>Li-Ion or Li-polymer Battery pack of 2000 mAh or higher. (Vendor shall mention DC voltage.)</li><li>Handheld radio shall be supplied with two batteries.</li></ul>
3	Rapid Charger	<ul style="list-style-type: none"><li>Single Unit, Desktop type Rapid Battery Charger.</li></ul>
4	Belt Clip with Proper lock	Belt clip with proper lock. If the clip is provided on battery, it shall be provided for both the batteries.
5	Carrying Case	Suitable carrying case.
6	Operating Manual	Hardcopy, one for each handheld radio
7	Technical/ Service Manual	Hardcopy and Softcopy in desired quantity
8	Programming Interface & Software	All necessary Radio Programming Hardware, Cables, Connectors and Software in desired quantity
9	Training	<div>Necessary Technical Training regarding</div> <ul style="list-style-type: none"><li>Configuring the Handheld Radio,</li><li>Operational,</li><li>Repairs and Maintenance</li></ul>
<b>Notes</b>		

1	Protocol and Signaling Scheme	Mobile Radios, Handheld Radios and Repeaters shall be same in respect of protocol (TDMA), type of emission and signaling scheme etc. and shall be mutually interoperable, so that full functional network can be established using these radios and repeaters.
2	Certificates of Tests	Vendor shall provide the certificates from OEM for each of the parameters of the radios and repeaters mentioned below: <ol style="list-style-type: none"> <li>1. Environmental Specifications and Standard Test as per IS 9000.</li> <li>2. Other radio parameters those cannot be tested / verified in the client's lab.</li> </ol>
3	Interoperability	Vendor shall mention other manufacturer, Models of the radios which are interoperable to the radios offered.
4	Service and Spare Parts support	Support for Service / Spare Parts – Min. 5 Years and spare availability within four weeks after receipt of supply order.

### 3.36 Repeater

Approximate Cost: Rs.0.65 Lakh

#### 3.36.1 GENERAL SPECIFICATION

Sr. No.	Specification	Qualitative Requirement
<b>General</b>		
1	Frequency Range	VHF 136MHz to 174MHz, Full Band UHF 400 MHz to 470 MHz Full Band
2	Frequency spread	38 MHz
3	Channel Capacity	16 or more
4	Protocol	TDMA (open standard)
5	Channel Spacing	Analog- 12.5 KHz, 25 KHz. Digital – TDMA 12.5 KHz
6	Type of Emission	As per standards, specific to requirement as mentioned in Sr. No. 5 above
7	Frequency Stability	+/- 1.5 PPM or better
8	Antenna Port Impedance	50 Ohms
9	Type of Operation	Repeater Mode, Press to Talk
10	Indication	Separate LED indication for transmit, receive and standby mode.
11	Duty Cycle	Continuous (100 %)
12	Protection	(i) In case of impedance mismatch, the final PA stage should not be damaged. (ii) The size of the heat sink shall be adequate to ensure heat sink temperature under steady condition does not rise more than 20 °C above Ambient Temperature.
13	Repeater Configuration Facility	PC Programming, Windows based.
14	Power Source/ Operating Voltage	Integrated power supply having <ul style="list-style-type: none"> <li>• Input – 230 V AC +/- 10 %, 50 Hz</li> <li>• 12 V DC +/- 10% (Negative Ground and Battery Reverse Protection)</li> <li>• Automatic changeover to battery in case of Mains failure</li> <li>• In case of no integrated power supply, Separate power supply cum battery charger shall be provided.</li> <li>• Battery Input port 12 V DC +/- 10 % (Negative Ground and Battery Reverse Protection)</li> </ul>
<b>Transmitter</b>		
1	RF Power Output	5 to 50 Watt (adjustable) 45 Watt @ 100 % Duty Cycle
2	Frequency Deviation	±2.5 KHz Max for 12.5 KHz Channel Spacing ± 5KHz Max for 25KHz Channel spacing

3	Spurious & Harmonics Response	Better than 70 dB
4	Modulation Distortion/ Audio Distortion	Less than 3% @ 1 KHz
5	Modulation Sensitivity	Upto 10mV @ 1 KHz Mic input for +/- 1.5 KHz standard deviation for 12.5 KHz
<b>Receiver</b>		
1	Sensitivity	Analog – 0.3 $\mu$ V for 12 dB SINAD 0.22 $\mu$ V typical Digital - 0.3 $\mu$ V @ 5 % BER
2	Audio Output (Int.speaker)	0.5 Watt minimum @ 5 % Distortion
3	Adjacent Channel Selectivity	60 dB @ 12.5 KHz 70 dB @ 25 KHz
4	Inter Modulation Distortion	70 dB
5	Image Rejection	70 dB
<b>Environmental Specifications</b>		
1	Operating Temperature Range	-30 ° C to + 60 ° C
<b>Features</b>		
1	Mode of operations	<ul style="list-style-type: none"> <li>Repeater should operate in Analog, Digital and Mixed Mode</li> </ul>
2	IP Compatibility	<ul style="list-style-type: none"> <li>To extend coverage of the communication system, the repeater should be capable for working with IP Network either using leased IP lines, IP VPN or Microwave Link, for voice, data and signaling with all features in digital and analog mode.</li> <li>All necessary Hardware, Software and Licenses if any shall be provided.</li> </ul>
3	Network Control	Repeater should support Network controlling.
4	Trunk Mode	Repeater should support single site and multisite mode.
<b>Accessories &amp; Manuals</b>		
1	Battery Cable	Battery cable having 3 meter length with suitable fuse.
2	Handset	Handset having MIC PTT and DTMF Key Pad with suitable clip
3	Loud Speaker	Suitable External Speaker (If no internal speaker is provide)
4	Duplexer	Duplexer having <ul style="list-style-type: none"> <li>Rx-Tx separation 5 MHz minimum.</li> <li>Insertion loss 1.5 dB and</li> <li>Rx Isolation at TX freq better than 70 dB</li> <li>Port impedance 50 ohms</li> </ul>
5	Programming Kit	All necessary hardware, cables, connectors and software in desired quantity
6	Antenna and Feeder cable	<ul style="list-style-type: none"> <li>3 dB GP Antenna with suitable fitting Clamps</li> <li>30 meter RF Coaxial Cable RG 217 with</li> </ul>

		suitable connectors
7	Power Supply (In case of no in-built mains power supply provided)	<ul style="list-style-type: none"> <li>• Power supply cum battery Charger</li> <li>• Input 230 V AC +/- 10%, 50 Hz</li> <li>• DC Output 13.8 V/ 30Amp</li> </ul>
8	Cabinet	Rack Mounting as well as desktop compatible.
10	Operation Manual	Hard copy one for each repeater
11	Technical/ Service Manual	Hardcopy and softcopy in desired quantity
12	Training	<ul style="list-style-type: none"> <li>➤ Necessary technical training regarding               <ul style="list-style-type: none"> <li>• Configuring the repeater</li> <li>• System Planning and operation</li> <li>• Repairs and maintenance</li> </ul> </li> <li>➤ Training shall be given to 10 technical persons for one week at Kerala.</li> </ul>
<b>Notes</b>		
1	Protocol and Signaling scheme	Mobile radios, handheld radios, repeater should be same in respect of protocol (TDMA), type of emission and signaling scheme etc. and should be mutually interoperable, so that full functional network can be established using these repeaters and radios.
2	Certificates of Tests	Vendor shall provide the certificates from OEM for each of the parameters of the radios and repeaters mentioned below: <ol style="list-style-type: none"> <li>1. Environmental Specifications and Standard Test as per IS 9000.</li> <li>2. Other radio parameters those cannot be tested / verified in the client's lab.</li> </ol>
3	Interoperability	Vendor shall mention other manufacturers, Models of the repeaters and radios which are interoperable to the system offered.
4	Installation and Commissioning of the Repeater sites	The vendor will be responsible for installation and commissioning of the repeater including microwave links.
5	Service and Spare Parts support	Support for Service / Spare Parts – Min. 5 Years and spares availability within four weeks after receipt of supply order.

### **3.37 Megaphone**

Approximate Cost: Rs.0.3 Lakh

#### **3.37.1 GENERAL SPECIFICATION**

- Power output; 16 watt rated, 20 watt maximum
- Voice range : 0.40 km(1 km in quiet area)
- Power source : 12 volts DC, 8 x UM-2 CELLS
- Microphone: Unidirectional, with volume control & press to talk switch
- Dimension: Horn diameter 220 mm, length 370 mm
- Weight: 2 kg(approximate)
- Operation: Dry cell & car battery operation
- Body: Sturdy & light weight with inbuilt siren

#### **3.37.2 BIS SPECIFICATION**

- The megaphone shall be able to withstand the following climatic severities:
- Dry heat : + 70C
- Cold heat : - 10C
- Damp heat: 2 cycles
- Weight : No more than 2 kg.
- Harmonic distortion: should be less than 10% at 1000 Hz
- m)Frequency response : overall frequency response shall be within plus minus 3 db from 300 to 3000 Hz. IS-7136

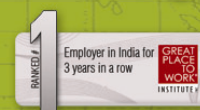




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