

**TANILNADU GENERATION AND DISTRIBUTION  
CORPORATION (TENGEDCO)**

**2X660 MW ENNORE SEZ STPP  
AT ASH DYKE OF NCTPS, CHENNAI.**

**TECHNICAL SPECIFICATION  
FOR  
FIRE TENDERS AND SAFETY EQUIPMENT  
VOLUME – II B**

**SPECIFICATION NO.: PE- TS- 412- 550- A001, Rev 01**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
NOIDA, INDIA**

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**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IA

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IA**

**INTENT OF SPECIFICATION**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS &SAFETY EQUIPMENT**

SPEC NO.PE-TS-412-550-A001

SECTION: I

SUB-SECTION: IA

REV.NO.01

DATE: 12.01.2018

**1.0 INTENT OF SPECIFICATION**

- 1.1 This specification covers the design (i.e. preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles, fill of lubricants & consumables along with spares for start-up and commissioning as required, forwarding, proper packing of accessories, shipment and delivery at site and carrying out Performance guarantee / Functional / Demonstration tests at site, training of customer/client O&M staff (if applicable), permanent registration and one year insurance of the vehicles in the name of end customer and handover in flawless condition of the package to the end customer complete with all accessories for the total scope defined as per tender technical specification, amendment & agreements till placement of order.

The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.

- 1.2 It is not the intent to specify completely all details and construction of the equipment. However, all the equipment shall conform, in all respect, to high standard of engineering, design and workmanship and be capable of performing in continuous commercial operation up to desired period.
- 1.3 BIDDER's guarantee in a manner acceptable to the PURCHASER who will interpret the meaning of drawing and specification and shall have power to reject any work or material which, in his judgement, are not in full accordance with specified specification and technical parameter.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
- 1.6 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are hereby made part of the tender specifications. The equipment / material and works covered by this specification is subject to compliance to all the attachments referred in the specification. The tenderer shall be responsible for adherence to all requirements stipulated herein.
- 1.7 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol.-III of the specification within 10 days of receipt of tender documents. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as



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per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

- 1.8 No deviation is permitted in normal case. Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.
- 1.11 In the event of conflict between requirements of two clauses of this specification/ documents or requirements of different codes/standard specified, the more stringent requirement as per interpretation of owner shall apply.
- 1.12 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.13 BHEL's Customer's representative shall be given full access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to him.
- 1.14 Various codes and standards to be used shall be as indicated in various parts of the specification. In case bidder uses any standard other than those indicated in the specification, the onus of establishing equivalence of the same with the specified standards will rest with the bidder and acceptance of the same shall be sole prerogative of customer. The bidder will also arrange for BHEL a copy of the standards in ENGLISH language. The cost of such service will be deemed to have been included by the bidder in the total cost of the package. BHEL will not entertain any additional cost on account of the same.
- 1.15 All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.
- 1.16 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 1.17 The inspection and testing of all the equipment shall be as per approved quality Plan/Inspection checklist.



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**Note:**

Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7.
- Internet speed – 2 mbps (Minimum preferred).
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked.
- Vendor's internal proxy setting should not block DMS application's link (<http://dmsserver.bhelpem.com/Wrench%20Web%20Access/Login.aspx>).



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SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: **IB**

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IB**

**PROJECT INFORMATION**

**CHAPTER 1****PROJECT SYNOPSIS****1.0 GENERAL BACKGROUND AND SALIENT FEATURES****1.1 Introduction**

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

**1.2 Location**

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

**1.3 Type of Plant**

The proposed 2x660 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

**1.4 PROJECT INFORMATION**

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**



2 x 660 MW Ennore SEZ Supercritical Thermal Power  
Project at Ash Dyke of NCTPS  
Spec. No. CE/C/P&E/EE/E/OT.No.03 /2013-14



Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

### LOCATION

The site is located near Vayalur Village, Ennore

Latitude : 13°17' N to 13°18' N

Longitude : 80°18' E to 80°19' E

Distance from Chennai City : 35 km

Nearest Airport is at Chennai at a

Distance of : 60 km

Nearest Seaport is : Ennore

Nearest Railway Station is : Athipattu Pudunagar (approx 5 kms)

### Meteorological Condition

**Climate** : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data : Ambient temp. (°C)  
Annual Maximum Mean Temp 41.5(°C)  
Annual Minimum Mean Temp 24(°C)  
Design Ambient temperature 35(°C)

#### Relative Humidity

Maximum 100%

Minimum 36%

Design 75%

#### Annual Rainfall

Maximum 2540 mm

Average 1600 mm

Minimum 1175 mm

#### Prevailing Wind Direction

Nov to Jan – From NW & NE



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Feb to Mar – From East & SE  
 Apr to May – From South & SE  
 June – From SW  
 July to Aug – From NW  
 Sept to Oct – From SE & SW  
 Wind Speed 11.8 kmph (avg)  
 50 kmph (max)  
 Seismic Zone III as per  
 IS:1893-2002

### 1.5 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

### 1.6 Plant Rating, Capacity, Availability, PLF

Each of the two units shall have a Turbine maximum continuous rating (TMCR) of 660 MW at generator terminals based on the following site conditions.

- Ambient air temperature
- Condenser cooling water inlet temperature of 33°C and 9°C temperature rise across the condenser.
- Generator power factor of 0.85.
- Fuel specification as given elsewhere.
- Design temperature for electrical equipment is 50°C.

The VWO capacity of the steam turbine shall not be less than 105% of TMCR flow at rated parameters. Boiler maximum Continuous Rating (BMCR) will be established to match the steam flow at VWO conditions, but BMCR flow shall not be less than 108% of TMCR flow.

The capacity of the unit is selected so as to deliver the rated output even after ageing that will occur between overhauls, as a result of deposition of salts in turbine blades, wear and tear etc.

The plant load factor (PLF) being considered is 85%.

### 1.7 Power Evacuation

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines. The power evacuation lines would be double circuit 400 KV lines which will act as Line in & Line out circuit.



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## 1.8 Site Selection

The following factors which influence the project site selection have been found very favourable to establish and operate the project.

- a. Availability of fuel.
- b. Existing power plant
- c. Availability of adequate cooling water.
- d. Availability of adequate land for locating the power plant with approach roads.
- e. Suitability of land from topographical and geological aspects
- f. Proximity of National Highways, Ports & Transport of fuel & heavy equipment.
- g. Facility for interconnection with transmission and distribution system for evacuation of power.
- h. Environmental aspects.

Total land required for the project is 500 acres which is under the possession of TANGEDCO.

## 1.9 Fuel

### 1.9.1 Source of Fuel

Domestic coal requirement for the power plant will be sourced from Kalinga block of Talcher coal fields, Mahanadi and IB valley coal fields in the state of Orissa. Coal will be transported by sea. The port of dispatch and port of receipt for domestic coal would be Paradip port and Ennore port respectively. Imported coal shall be sourced from foreign countries through sea to Ennore port.

Coal can be transported from coal mines to Ennore port by sea and unloaded at proposed coal berth-III. Further the coal can be transported to the proposed power plant through pipe conveyor which shall have a system capacity of 2 x 2000TPH.

The steam generator shall be designed for the following conditions :

- **Best Coal** – 100% Imported Coal
- **Design Coal** – 70% Imported & 30% Domestic Coal
- **Worst Coal** – 50% Imported & 50% Domestic Coal

The analysis of fuel is given below :

### 1.9.2 Coal Analysis:

#### Coal Quality Parameters

| SL.NO | DESCRIPTION    | DOMESTIC COAL | IMPORTED COAL  |
|-------|----------------|---------------|----------------|
| 1.    | HIGHER HEATING | 2800 (GCV as  | 6250 ( GCV Air |



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|    |                                                                                           |                                                                     |                                             |
|----|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------|
|    | VALUE<br>-As Fired basis given<br>Kcal/kg                                                 | received basis)                                                     | dried basis)<br>5642 (as received<br>basis) |
| 2. | TOTAL MOISTURE %                                                                          | During rainy<br>season<br>20% ( inherent +<br>surface)              | 16.5%                                       |
| 3. | HGI<br>Abrasive ness expected<br>YGP<br>Shale and sand stone<br>content<br>Feed coal size | 45 to 55<br>Average 52<br>50 to 70 mg/kg<br>20% max.<br>upto 50 mm. | 51                                          |

**DOMESTIC COAL**

| Sr. No. | Particulars                                | Units | Parameters |
|---------|--------------------------------------------|-------|------------|
| A.      | <b>Proximate Analysis</b>                  |       |            |
| 1.      | Moisture                                   | %     | 16.00      |
| 2.      | Volatile Matter                            | %     | 19.00      |
| 3.      | Ash                                        | %     | 45.00      |
| 4.      | Fixed carbon                               | %     | 20.00      |
|         | Total                                      | %     | 100        |
| B.      | <b>ULTIMATE ANALYSIS, % ( As received)</b> |       |            |
| 1.      | Carbon                                     | %     | 27.70      |
| 2.      | Hydrogen                                   | %     | 2.60       |
| 3.      | Nitrogen                                   | %     | 0.52       |
| 4.      | Oxygen                                     | %     | 7.26       |
| 5.      | Sulphur                                    | %     | 0.50       |
| 6.      | Ash                                        | %     | 45.00      |
| 7.      | Moisture                                   | %     | 16.00      |
| 8.      | Carbonates                                 | %     | 0.38       |
| 9.      | Phosphorous                                | %     | 0.04       |
| 10.     | Others                                     | %     | -          |
|         | Total                                      | %     | 100.00     |
| C.      | <b>Ash fusion temperature</b>              | deg C |            |
| 1.      | Initial deformation, IT                    | deg C | 1100       |
| 2.      | Spherical, ST                              | deg C | 1200       |
| 3.      | Hemispherical, HT                          | deg C | 1300       |
| 4.      | Fluid, FT                                  | deg C | -          |
| D.      | <b>Ash Analysis, %</b>                     |       |            |
| 1.      | SiO <sub>2</sub>                           | %     | 59.54      |
| 2.      | Al <sub>2</sub> O <sub>3</sub>             | %     | 29.00      |
| 3.      | Fe <sub>2</sub> O <sub>3</sub>             | %     | 6.42       |
| 4.      | CaO                                        | %     | 1.50       |
| 5.      | Na <sub>2</sub> O                          | %     | 0.08       |



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| Sr. No. | Particulars                   | Units    | Parameters             |
|---------|-------------------------------|----------|------------------------|
| 6.      | K <sub>2</sub> O              | %        | -                      |
| 7.      | TiO <sub>2</sub>              | %        | 1.60                   |
| 8.      | SO <sub>3</sub>               | %        | 0.25                   |
| 9.      | P <sub>2</sub> O <sub>5</sub> | %        | 0.51                   |
| 10.     | MgO                           | %        | 0.50                   |
| 11.     | Others                        | %        | 0.60                   |
| 12.     | Total                         |          | 100.00                 |
| E       | <b>Resistivity of fly ash</b> | Ohm - cm | 1.73x 10 <sup>12</sup> |

**IMPORTED COAL**

| Sr. No. | Particulars                               | Units | Parameters |
|---------|-------------------------------------------|-------|------------|
| A.      | <b>Proximate Analysis (As received)</b>   |       |            |
| 1.      | Moisture                                  | %     | 16.50      |
| 2.      | Volatile Matter                           | %     | 36.45      |
| 3.      | Ash                                       | %     | 6.62       |
| 4.      | Fixed carbon                              | %     | 40.43      |
| 5       | Total                                     | %     | 100.00     |
| B.      | <b>ULTIMATE ANALYSIS, % (As received)</b> |       |            |
| 1.      | Carbon                                    | %     | 60.12      |
| 2.      | Hydrogen                                  | %     | 4.38       |
| 3.      | Nitrogen                                  | %     | 1.48       |
| 4.      | Oxygen                                    | %     | 10.37      |
| 5.      | Sulphur                                   | %     | 0.53       |
| 6.      | Ash                                       | %     | 6.62       |
| 7.      | Moisture                                  | %     | 16.5       |
| 8.      | Carbonates                                | %     | -          |
| 9.      | Phosphorous                               | %     | -          |
| 10.     | Others                                    | %     | -          |
|         | Total                                     | %     | 100.00     |
| C.      | <b>Ash fusion temperature</b>             | deg C |            |
| 1.      | Initial deformation, IT                   | deg C | 1230       |
| 2.      | Spherical, ST                             | deg C | 1270       |
| 3.      | Hemispherical, HT                         | deg C | 1320       |
| 4.      | Fluid, FT                                 | deg C | -          |
| D.      | <b>Ash Analysis, %</b>                    |       |            |
| 1.      | SiO <sub>2</sub>                          | %     | 36.00      |
| 2.      | Al <sub>2</sub> O <sub>3</sub>            | %     | 13.90      |
| 3.      | Fe <sub>2</sub> O <sub>3</sub>            | %     | 14.80      |
| 4.      | CaO                                       | %     | 12.70      |
| 5.      | Na <sub>2</sub> O                         | %     | 0.70       |
| 6.      | K <sub>2</sub> O                          | %     | 1.70       |
| 7.      | TiO <sub>2</sub>                          | %     | 0.80       |



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| Sr. No. | Particulars                   | Units | Parameters |
|---------|-------------------------------|-------|------------|
| 8.      | SO <sub>3</sub>               | %     | 10.60      |
| 9.      | P <sub>2</sub> O <sub>5</sub> | %     | 0.20       |
| 10.     | MgO                           | %     | 8.60       |
| 11.     | Others                        | %     | -          |
| 12.     | Total                         | %     | 100.00     |

The plant should be suitable to accept imported coal sourced from any country. The limiting parameters of imported coal are furnished below :

| S. No. | Particulars                     | Unit      | Parameter      |
|--------|---------------------------------|-----------|----------------|
| 1      | Total Moisture (ARB)            | %         | Up to 23 (Max) |
| 2      | Ash (ADB)                       | %         | Up to 20 (Max) |
| 3      | Gross Calorific Value (ADB)     | Kcal / Kg | 5800 - 6500    |
| 4      | Sulphur (ADB)                   | %         | Up to 1 (Max)  |
| 5      | Fixed Carbon (ADB)              | %         | 30-50          |
| 6      | Volatile Matter (ADB)           | %         | 25-45          |
| 7      | HGI                             |           | 45-60          |
| 8      | IDT (Under Reducing Atmosphere) | Deg C     | 1100-1250      |
| 9      | Size                            | mm        | < 50           |

**Note:** ADB stands for “As dried Basis” and ARB for “As Received Basis”

### 1.9.3 Specification of LDO

|                                          |        |
|------------------------------------------|--------|
| Specific gravity @ 15° C                 | 0.8348 |
| Gross calorific value, Kcal/kg           | 10400  |
| Pour point “°C” max.                     | 12     |
| Flash point “°C” min.                    | 66     |
| Sulphur % “T” max.                       | 0.5    |
| K. Viscosity in Centistokes @ 50° C max. | 7.5    |
| Ash by wt. %                             | 0.01   |
| Water & sediment Vol. Max. %             | 0.25   |

### 1.9.4 Specification of HFO

|                                          |     |
|------------------------------------------|-----|
| Flash point “°C” min.                    | 66  |
| K. Viscosity in Centistokes @ 50° C max. | 370 |



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|                                |       |
|--------------------------------|-------|
| Ash by wt. %                   | 0.1   |
| Water content by volume % max  | 1     |
| Sediment by weight % max       | 0.25  |
| Total Sulphur by weight % max  | 4.5   |
| Gross calorific value, Kcal/kg | 10800 |

### 1.9.5 Fuel Linkage

TANGEDCO has approached Ministry of Coal through Ministry of Power for the long term linkage of Coal from the coal sources of Talcher or Mahanadi in Orissa.

The coal requirement has been worked as under:-

Coal required at MCR per hr. (Blended) 872 tonnes

Per day 20928 tonnes.

Annual 6.5 MTPA for 85% PLF

### 1.9.6 Fuel Transportation

The coal shall be received at Ennore port. The coal will be transported by pipe conveyor from coal berth 3 in Ennore Port and then through 2 x 2000 TPH pipe conveyor to the bunker directly or to stockyard.

### 1.10 Source Of Water

#### 1.10.1 Source

The raw water intake shall be from the existing cooling water forebay of NCTPS PHASE-II.

#### 1.10.2 Chemical analysis of Sea Water:

As given in Annexure-1, Volume III, Chapter- 3.

#### 1.10.3 Requirement

The requirement of water for the plant will be for meeting the requirement of make up for the re-circulating cooling water system, dust suppression system in coal handling plants, ash disposal system and the RO/ D.M. water plant which will be supplying the power cycle make up requirements, etc. In addition the water requirements will be for drinking and service purposes. Water requirement is estimated as approx. 15523 m<sup>3</sup>/hr.



**1.11 Source of Equipment**

The proposed plant will be supplied, erected and commissioned on Single EPC basis.

**1.12 Power Evacuation Plan**

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines.

**1.13 400 KV GIS Switchyard**

The 400 KV Switchyard is proposed to have one and a half bus arrangement and will comprise following bays/circuits :

- ◆ 2 – Generator transformer bays
- ◆ 1– Start up transformer bay
- ◆ 4 – Line Bays
- ◆ 2 – Bus VT's
- ◆ 2 – Bus Reactor Bays
- ◆ 2 – Spare bay (Equipped)
- ◆ 1 – Equipped bay for future GT
- ◆ 2 – Equipped bays for future lines

The switchyard will be complete with galvanized steel structures, lightning surge arrestors, OPGW Equipment, CTs, PTs of suitable VA burden and accuracy class as required for measurement protection and communication, insulators, bus-bars clamps & hard wares etc. The switchyard will be controlled by computerized control and data acquisition (SCADA) system.

**1.14 Average Yearly Generation**

The average yearly generation is calculated considering the following.

- The expected plant load factor is 85 %. With this PLF the average yearly generation will be around 11914 Million units.

**1.15 INFORMATION FOR ENVIRONMENTAL APPRAISAL****1.0 GENERAL INFORMATION ABOUT THE PROJECT**

- |     |                             |   |                                                                                           |
|-----|-----------------------------|---|-------------------------------------------------------------------------------------------|
| 1.1 | Name / Title of the Project | : | 2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS |
| 1.2 | Name of Owner               | : | Tamilnadu Generation and Distribution Corporation (TANGEDCO)                              |



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- 1.3 Location of the Project : Near Vayalur Village, Ennore, Tamil Nadu
- 1.4 Site where proposed plant is to be located : Ash dyke of NCTPS
- 1.5 Capacity of the project under consideration : 2x 660MW
- 1.5.1 Govt. land / Private land / others : TANGEDCO land
- 1.5.2 Topographical feature, demographic profile & physiography : Site has differential levels and require filling to maintain the desired grade level of +10.00 meter above MSL
- 1.5.3 Nature of soil : Clayey soil
- 1.5.4 Distance from the nearest town / city / major human settlements : Chennai -35 km
- 1.5.5 Population to be displaced : Nil
- 1.5.6 Distance from water source : Approx. 5 km (from Cooling Water Forebay of NCTPS Stage II)
- 1.5.7 Area of forest land, if involved : Nil
- 1.5.8 Distance of forest from the site : N.A
- 1.6 Is this an extension? If so indicate capacity of existing plant : No
- 1.7 What is the ultimate capacity envisaged : 2x660 MW
- 2.0 GENERAL ENVIRONMENTAL INFORMATION**
- 2.1 Area of the land proposed to be acquired : Refer Plot Plan Land already acquired
- i. Area required for plant : 500 Acres
- ii. Ash disposal : 100 % dry fly ash disposal and



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- 100% wet bottom ash disposal is envisaged to existing ash pond.
- iii. Plant facilities : The area is adequate for locating all the required systems for 2x660 MW.
- 2.2 Area proposed to be built-up or developed : Power station will be built-up in the proposed site as indicated in the plot plan.
- 2.3 Specify site characteristics River basin/ estuarine / coastal / others : Site is close to Buckingham Canal
- 2.4 Is the site situated in the forest area? Give following details : No
- 2.4.1 Area : N.A
- 2.4.2 Type of forests : N.A
- 2.5 Is site situated near to the forests? Give the distance from the site. : N.A.
- 2.6 Give a description of the flora within 25 km of your plant site under the following heads :
- a. Crops :  
b. Forest :  
c. Grass land :  
d. Endangered species :  
e. Others (Specify) :
- } Refer details in the specification elsewhere.
- 2.6.2 Give details of the following features, if they exist, within a radius of 25 km of the proposed site? :
- i. Fisheries :  
ii. Sanctuary / natural park biosphere reserve :  
iii. Lakes / ponds / reservoir :  
iv. Stream / river : Buckingham canal is close to the site  
v. Estuary / sea : Bay of Bengal is 5 km from site



- vi. Hills / mountains :
- vii. Historic / cultural /  
tourist /  
archaeological scenic  
sites / defence  
installations :
- 2.7 Human settlement :
- 2.7.1 Total number of persons :  
proposed to be employed
- i. During construction : 2500  
  
450(0.75person/MW) TANGEDCO
- ii. During operation : direct employees



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**FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IC

REV NO : 0

DATE: 10.08.2017

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IC**

**SCOPE OF SUPPLY & DETAIL TECHNICAL  
 REQUIREMENTS.**



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## **1.0.0 SCOPE**

### **1.1.0 SCOPE OF SUPPLY**

#### **1.1.1 FOAM TENDER**

- i) One number Foam tender {including 16 ton vehicle chassis, pump capacity (1800LPM@8.5 Kg/cm<sup>2</sup> (g) minimum), Water tank (4500 liter capacity)} conforming to IS: 10460, complete with all accessories and equipment's as specified herein & including those specified in **Annexure-I** of this section. Driver and crew cabin shall be air conditioned.
- ii) First fill of chemicals & consumables during performance demonstration.
- iii) Replenishment of consumables & chemicals consumed during performance demonstration of tenders.

#### **1.1.2 WATER TENDER**

- i) One number Water tender {including 25 T vehicle chassis, Pump of Capacity (4000 LPM @ 0.7 Mpa and 300 LPM @ 3.5 Mpa), Water Tank (7000 Liter Capacity)} conforming to IS: 950:2012, complete with all accessories and equipment's as specified herein & including those specified in **Annexure-II** of this section. Driver and crew cabin shall be air conditioned.
- ii) First fill of chemicals & consumables during performance demonstration.
- iii) Replenishment of consumables & chemicals consumed during performance demonstration of tenders.

#### **1.1.3 FIRE JEEP.**

- i) One number Fire Jeep on Bolero SLE BS-IV (5 seater).

#### **1.1.4 AMBULANCE**

- i) One number Road Ambulance on TATA SFC 407 Ex / 31 WB BS IV TT (including chassis) conforming to Type B – Patient transport vehicle AIS 125, complete with all accessories and equipment as specified & described herein this section.

#### **1.1.5 FIRE SAFETY EQUIPMENT**

- i) Fiber glass blanket – 06 nos.
- ii) Fire proximity suit – 02 nos.
- iii) Telescopic ladder – 02 nos.
- iv) Self-contained breathing apparatus – 06 nos.



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v) Canister type mask for chlorine contaminated area – 04 nos.

vi) First Aid Kit – 02 Sets.

**1.1.6** Maintenance tools and tackles as mentioned in Annexure III of this section shall be provided per vehicle.

**1.2.0 SCOPE OF SERVICES**

- i) Performance demonstration of fire water tender, foam tender, fire jeep, road ambulance and safety equipment at site and training of owner's personnel.
- ii) Registration, permit, taxes, insurance including charges of all the above listed vehicles before handing over to TANGEDCO with name transfer.

**2.0.0 CODES AND STANDARDS**

The design, material of construction, workmanship & finish, performance testing, accessories and equipment of fire water tender, foam tender and Ambulance specified herein shall comply with the requirements of codes/standard as follows:

IS: 10460 - Functional requirements for small foam tender for fire brigade use.

IS: 950 Type-B (Latest) - Functional requirements for fire water tender, Type-B for fire brigade use.

AIS 125 – Constructional and functional requirements of road ambulance.

**(A) DESCRIPTION ON FOAM TENDER**

**3.0.0 VEHICLE CHASSIS**

The chassis for carrying out fabrication work of foam tender shall be of Make-TATA/Ashok Leyland/Eicher/equivalent. The chassis shall be equipped with power assisted steering and power brake. Chassis shall be BS-IV compliant.

**4.0.0 GENERAL REQUIREMENTS**

**4.1.0** The appliance shall incorporate a fire pump of 1800 L/min capacity, a water tank of 4500 ltr. Capacity, a foam tank of 500 ltr capacity, connected equipment for foam production and supplementary extinguishing agent (S.No. 10.0.0).

- |    |                                                                    |                                                             |
|----|--------------------------------------------------------------------|-------------------------------------------------------------|
| a) | Gross vehicle weight.                                              | Not less than 16000 Kg including crew, water and equipment. |
| b) | Maximum speed on level road fully laden.                           | 72 Km / h.                                                  |
| c) | Acceleration from a standing start through the gears, fully laden. | 64 Km/h in 55 seconds                                       |



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- d) The appliance shall be capable of being started from rest on a gradient of 1 in 4.
- e) When travelling at 48 km / h on a level dry surface the foot brake shall be capable of stopping the vehicle within a distance of 15 m from the point at which the brake is applied. The hand brake shall be capable of holding the fully laden appliance on a dry surface gradient of 1 in 4 when in neutral gear.
- f) The appliance shall have the following overall dimensions:
- |                |                       |
|----------------|-----------------------|
| Wheel base     | not more than 4500 mm |
| Turning circle | not more than 20 m    |
| Road clearance | not less than 260 mm  |
| Overall width  | not more than 2.50 m  |

**Note: - The chassis shall meet the prevailing emission norms and shall totally comply with the Central Motor Vehicle Rules.**

- 4.2.0 The monitor shall employ the self-aspiration type of foam production system where aeration is done at the branch pipe. The expansion ratio of the foam produced shall not be less than eight times with the use of foam compound as prescribed in IS: 4989 (latest edition).
- 4.3.0 The foam induction shall be automatic if one branch is in operation, all further addition and removal of branches shall automatically adjust the rate of foam compound induction within variation of 0.5 percent, the induction ratio not exceeding 6 percent.
- 4.4.0 A hose reel service shall be provided on the appliance. In addition to water carried on it, it shall also be possible to use water from a hydrant/ a static supply.
- 4.5.0 The supplementary agent used for firefighting shall be dry chemical powder (2x75 Kg capacity) and Carbon Di-oxide type (2x4.5 Kg as per IS: 15683).
- 4.6.0 The unit shall be designed to be as compact as possible, compatible with ease of accessibility to all service parts. The pump and foam making equipment controls shall be so arranged that one man can operate foam or water lines from the pump control panel.
- 4.7.0 Lever type valve controls shall be preferred throughout.
- 4.8.0 All parts, which shall form waterways or come into contact with foam solution, shall be of corrosion resisting materials suitably treated with corrosion resistant compound. All metal parts exposed to atmosphere shall either be of corrosion resisting material or treated suitably to resist corrosion.
- 4.9.0 Lubricating nipples shall be provided wherever necessary.

## **5.0.0 DESIGN AND CONSTRUCTION**

### **5.1.0 Engine**



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- 5.1.1 The engine shall be provided with cooling system to permit its continuous stationary running without overheating. Indirect cooling system shall be incorporated which shall be of the open circuit type discharging water to the waste.
- 5.1.2 The operating temperature of the engine cooling water shall preferably be thermostatically controlled.
- 5.1.3 The oil in the oil sump shall be prevented from overheating
- 5.1.4 Suitable gauge for cooling water and glow lamp for lubricating system shall be provided in the driver's cab and on the pump panel. This shall be marked with operating temperature.
- 5.1.5 External filter shall be provided for the lubricating system and a tubular dip-stick to gauge the level of oil in the oil sump shall be provided.

### **5.2.0 Electrical System**

- 5.2.1 A sealed maintenance free battery of adequate capacity with a trickle type battery charger shall be provided for recharging the battery in situ. A red pilot lamp, indicating when the batteries are being charged from an external supply, shall be provided.
- 5.2.2 All important electrical circuits shall have separate fuses suitably indicated and shall 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 shall be single pole and shall not be exposed to the atmosphere. Conduits shall be used wherever necessary.

### **5.3.0 Water Tank**

- 5.3.1 A water tank of not less than 4500 litres capacity shall be mounted on the chassis. It shall be fabricated out of mild steel sheet of minimum 3.0 mm thickness. Bottom sheet shall be minimum 5 mm thick. The tank shall be treated for anti-corrosion with epoxy paint consisting of one coat of primer and two coats of finish paint after shot blasting of inside surface and shall be suitably baffled to prevent surge when the vehicle is braking, accelerating or cornering. The baffle shall be arranged in a manner to facilitate the passage of a man throughout the tank for cleaning purposes. Minimum thickness of baffle plate shall be 3.0 mm. It shall be mounted on the chassis in a manner keeping in view the proper load distribution on the axles and shall be so designed as to bring the centre of gravity as low as possible in the chassis. It shall be rectangular in shape and the mounting of the tank shall be flexible type to prevent the tank's distortion due to the chassis flexion. The mounting shall permit full contents of the tank to flow into the pump. The tank with its fitments shall withstand hydrostatic pressure of 0.3 bar.
- 5.3.2 Suitable eyes shall be provided on the shell of the tank to enable the tank to be lifted off the vehicle for repairs or replacement as necessary.
- 5.3.3 The tank shall be fitted with two filling orifices, a drain cock, a manhole and a cleaning hole (at the bottom of the tank). The filling orifice shall be of not less than 250 mm diameter and shall be fitted with a manhole cover of 450 mm dia. minimum and a filler cap clearly marked 'water' preferably cast in metal. In addition, a 63 mm instantaneous hydrant connection,



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incorporating a strainer, shall be provided close to the pump pane control for filling the tank through 75 mm diameter pipe or feeding the hose reel equipment. A 100 mm dia. pipe line shall be taken from the tank to the suction inlet of the pump incorporating a 100 mm quick action spherical type valve. Separate valve (s) for performing different functions shall be provided to control the flow of water. Manhole shall be located at the top of the tank. Drain plugs or cocks shall be provided wherever necessary. Cleaning hole of not less than 250 mm diameter shall be provided at the bottom of the tank and it shall be fitted with bolted cover.

- 5.3.4 The tank shall be fitted with a 100 mm diameter overflow pipe. The discharge ends of the overflow pipe shall be taken down to a point well below the chassis without reducing the effective ground clearance when fully loaded and shall discharge away from the wheels.
- 5.3.5 Dial gauge water level indicator for the tank shall be provided preferably in the driver's cab or a visual level gauge of the glass tube shall be provided at the control panel calibrated  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and full. (preferably calibrated in litres).
- 5.3.6 The tank shall be connected to the pump and hose reel in such a manner that pressurization of water tank or water tank-pump connection is not possible when pumping water from an outside source of supply.
- 5.3.7 The plumbing between the pump and the hose reel shall have a clear and unobstructed water way not less than 25 mm throughout without any obstruction.

#### **5.4.0 Hose Reel**

- 5.4.1 One hose reel conforming to IS: 884 shall be provided at the rear of the appliance with 60 m length of 20 mm bore hose connected by screw 'C' type quick release couplings and terminating with a control branch and 5 mm nozzle. The reel shall be fitted with over brake or locking device. Nozzle shall be dual purpose shut off type.

#### **5.5.0 Pump**

The pump shall preferably be made of any suitable alloy, compatible with all types of synthetic protein foam compound, with stainless steel shaft suitable for use with brakish water. The pumps be capable of delivering not less than 1800 l/min. of water at a pressure not less than 8.5 kg/cm<sup>2</sup>. The pump shall preferably be of the single stage type. The pump shaft shall preferably be designed with two deep-groove ball bearings lubricated by oil both to ensure long trouble-free service. A mechanical seal shall be provided which shall be capable of running dry for long periods without damage.

#### **5.5.1 PUMP TEST**

- 5.5.1.1 The pump shall run for a period of 4 hours non-stop delivering the rated output at 7 kg/cm<sup>2</sup> with the lift of 3 m. During the test the water shall not be replenished for the cooling system as the temperature of the engine oil should not exceed 150 deg. C at highest ambient or the engine manufacturers rated temperature for continuous working whichever is less. The engine should show no sign of stress during the stress. The temperature of the cooling water (radiator water) shall not exceed 85 deg.C. The PTO sump oil temperature shall not



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exceed the manufacturers recommended temperature for the grade of oil used. The pump casing and impeller shall be subjected to a hydraulic pressure of 21 kgf/cm<sup>2</sup> to detect leakages, performance, etc.

5.5.1.2 The pump shall be preferably rear mounted. The pump control panel shall be located on the rear of the appliance.

5.5.1.3 The suction inlet and delivery outlets of the pump shall, as far as possible, be fitted on or near the pump control panel.

5.5.1.4 A removable strainer and blank cap shall be provided for the suction inlets(s) for the pump.

5.5.1.5 The suction inlet shall be fitted with a standard round thread connection of 100 mm size conforming to IS: 902.

5.5.1.6 The delivery outlets of the pumps shall terminate in 63 mm female instantaneous coupling incorporating a blank cap and means for relieving pressure between the valve and the cap. The 63 mm female instantaneous coupling shall be in accordance with IS: 903-1988.

#### **5.6.0 Primer**

The primer may be automatic in action and it shall dis-engage automatically as soon as the pump is primed. It shall be integral with the pump. It shall be capable of lifting water at least through 7.0 m at a rate of not less than 30 cm per second.

#### **5.7.0 Power take off**

The gear ratio shall be suitable for continuous operation of engine at stationary condition.

#### **5.8.0 Foam Equipment**

5.8.1 Foam compound tank of 500 ltr capacity shall be mounted on the chassis in addition to the water tank and as a separate & distinct unit that can be removed separately for replacement.

5.8.1.1 The foam compound tank shall be of rigid type, and shall preferably be of stainless steel (SS-304) welded construction.

5.8.1.2 The tank shall have a filling orifice not less than 150 mm diameter with a removable strainer fitted to it. The strainer shall be of such material so that it shall not be affected by constant contact with foam compound and its total screening area shall be adequate to permit quick filling of foam compound into the tank. The filler cap shall be clearly marked 'FOAM' preferably by pressing, casting or embossing.

5.8.1.3 The tank shall have its top dished tunnelling arrangement and a trough provided to enable easy filling from 20 litre drums. Suitable sharp-edged tin opener may also be provided at the foam tank so that the foam compound drum can be puncture easily for facilitating quick filling of the foam compound directly from the drums into the tank. The tank shall be suitably baffled to prevent surge while the vehicle is in motion or standing on uneven ground or brakes are applied to the moving appliance. The design of the tank shall incorporate a removable sump fitted with a drain valve. The foam compound draw off tube



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shall be positioned in the centre of the sump in such a manner that foreign matter or sludge shall not pass into the compound line. The draw-off tube shall be fitted with a gauge strainer of suitable material, mesh, size, and adequate staining area. The tank top shall be removable and it shall be ensured that the joint between the top and the body of the tank is leak proof.

- 5.8.1.4 Means shall be provided for automatic venting of the foam compound tank when the foam is being produced or the tank is being filled. This shall not be incorporated with the cap. The device employed shall be as simple as possible and shall not get clogged easily during normal use of the appliance.
- 5.8.1.5 The draw-off tube shall be connected to the foam compound proportionator / inductor and pump as necessary, and automatic flow control valve shall be incorporated in it so as to maintain a constant induction rate of not more than 6 percent with varying foam output. The plumbing for this purpose shall have a clear and unobstructed passage of not less than 50 mm throughout and shall:
- be as short as possible;
  - be capable of being easily dismantled for internal cleaning;
  - be provided with means of thorough flushing after use;
  - not form 'U' bend or abrupt angle at any portion and be capable of being drained easily without dismantling.
- 5.8.1.6 A suitable transfer pump shall be provided for transferring foam compound from drums to the foam compound tank without causing any frothing in the tank. Necessary connection shall also be provided for transferring the foam compound through this pump.
- 5.8.1.7 Provision shall also be made for drawing foam compound into the foam producing system from an external source through a pick-up tube while producing foam.
- 5.8.2** Foam compound proportionator or inductor automatic proportionating arrangement shall be provided where the induction ratio of foam compound /water solution and flow of water are automatically varied as desired merely by opening and closing the monitor. This shall be achieved without any complex system of linkage that may be susceptible to distortion due to chassis flexion. The system shall be reliable and shall not require frequent calibration checks.
- 5.8.3 Foam Monitor**
- 5.8.3.1 Foam monitor shall be mounted on the top of the appliance in such a manner that it can be manually operated by a member of the crew. The monitor shall be capable of traversing through 360 deg. In a horizontal plane, elevating from horizontal to 45 deg. and depressing from horizontal to not less than 15 deg. and fully rotating in both directions.
- 5.8.3.2 The aggregate foam discharge shall be not less than 7000 L/min. through monitor.



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5.8.3.3 The monitor shall be capable of projecting the foam discharge to an effective distance of not less than 35 m in still air when operated at the designed pressure in a straight jet pattern without dripping.

### **5.9.0 Control panels**

5.9.1 One (1) No. adequately illuminated control panel shall be provided and shall be positioned at the rear of the appliance.

5.9.2 The control panel shall include the following:

- a) Throttle control for engine;
- b) Pressure gauge 0 to 2.0 N/mm<sup>2</sup> (20 Kg/cm<sup>2</sup>)
- c) Compound gauge calibrated as under;
  - (i) Vacuum - 0 to 75 cm Hg preferably in black
  - (ii) Pressure - 0 to 0.6 N/mm<sup>2</sup> (6 kgf / cm<sup>2</sup>); preferably in black
- d) Primer control (if the primer is not fully automatic);
- e) Gauge for cooling water and glow lamp for lubricating system;
- f) Cooling water circuit control.
- g) Control for using monitor.

5.9.3 The following shall also be provided at a convenient position near the control panel(s);

- a) Control for using monitor;
- b) Water level indicator;
- c) Hydrant connections;
- d) Control for using auxiliary foam compound pick up tube;
- e) Control(s) for flushing out the foam making equipment and its plumbing;

### **5.10.0 Body Work and Stowage**

5.10.1 Enclosed accommodation for six persons (1+1 at front, 1 full seat at the rear which will accommodate 4 people) shall be provided in the driver cab-crew compartment including the driver and the in-charge of the crew. Two doors on each side shall be provided on the driver cab-crew compartment. The doors shall be hinged opening outwards and shall be hung forward and shall have catch locks and flush type handles.



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- 5.10.2 The cab and lockers shall be of composite construction with sufficient rigidity and reinforcement and shall be kept as light as possible. Pressed sections of sufficient strength shall be used for the superstructure.
- 5.10.3 Two nos. of lockers on each side shall be provided for secure stowage of all equipment as detailed enclosed in **Annexure-I**. The height of the lockers from the bottom to the top of the opening shall be not less than 600 mm and the depth not less than 600 mm.
- 5.10.4 All lockers shall be provided with internal automatic lighting arrangement with the master switch in the cab. The doors of the side lockers shall not be hinged at the bottom.
- 5.10.5 Hose tunnels shall be provided to carry four 2.5 m lengths of suction hoses in convenient location. The tunnels shall be sloped in such a way so that these allow the water or contents left in the hose after use to flow out.
- 5.10.6 Ladder Gallows – Gallows shall be provided to carry a 10.5 m extension ladder at a suitable position in a manner that does not provide any obstruction to the working of monitor. The design shall be such that the ladder can be released without difficulty from a reasonably accessible position and shall embody rollers to permit easy withdrawal by one man. Means shall also be provided for locking the ladder when stowed.
- 5.10.7 Tool Kit Container – A specially fitted recessed tray for the normal kit of tools, carried on the appliance shall be provided.
- 5.11.0 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 30 degrees from the horizontal.

## **6.0.0 WORKMANSHIP AND FINISH**

- 6.1.0 All parts of the appliance shall be of good workmanship and shall have streamlined finish
- 6.2.0 The appliance shall be painted in fire red colour conforming to Shade No. 536 of IS: 5. The paint shall conform to IS: 2932-1974.

## **7.0.0 ACCESSORIES**

- 7.1.0 The following accessories shall be provided in addition to those normally fitted on modern commercial vehicles.
- Fire bell - A 250 mm diameter fire bell shall be mounted externally and shall be capable of being operated from within the driving compartment. The bell shall be the hand-operated type.
  - Hand Lamps - Two
  - Fog lamps - Two



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- d) Reversing Light - Lamp suitably situated to assist reversing.
- e) Amber blinker lights - Situated on the head of the driving compartment.
- f) Trafficators - Illuminated with indicating lights on instrument panel or in any other prominent position in driving compartment.
- g) Wind screen wipers.
- h) Tools - All tools required for normal maintenance of the appliance that are not included in the kit for the chassis.
- i) Siren - Battery operated.
- j) Search light – Adjustable to give flood or beam light, mounted in a convenient position but capable of being readily disconnected and mounted on a tripod away from the appliance, complete with tripod and with not less than 30 m of TRS cable on a reel mounted on the appliance.
- k) Spot light - Adjustable, mounted in a convenient position on the near side of the driving compartment.
- l) Inspection lamp – Protected type on wander lead with plug. A socket shall be provided in the control panel in the driver's cab for plugging in the lamp.
- m) Tail lamps - Two of combined stop and tail.
- n) Rear reflectors
- o) Wind Screen-Washer-Fitted in a suitable location with controls in driving compartment.
- p) Cab, Instrument panel and locker, light.
- q) Public address system.

### **8.0.0 MARKING**

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

- a) Manufacturer's name, or trademark, if any.
- b) Capacity of the pump in litres/minute, capacity of the water tank and foam tank in litres;
- c) Year of manufacturer

### **9.0.0 ADDITIONAL ACCESSORIES** (over and above accessories mentioned against CI 7.0.0)



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The additional accessories that are normally required to assist in operation of appliance are detailed in enclosed **Annexure I**. Bidder to include these accessories in their scope of supply.

#### **10.0.0 SUPPLEMENTARY EXTINGUISHING AGENT**

- 10.1.0 The supplementary extinguishing agent shall be dry chemical powder and Carbon Di-oxide extinguisher.
- 10.2.0 The total quantity of supplementary agent shall be not less than 150 kg. Of dry powder and shall conform to IS: 4308.
- 10.3.0 The dry powder system shall comply with the following minimum requirement.
- 10.4.0 The dry powder system shall comprise of two self-contained units, each having a capacity of 75 kg of dry powder.
- 10.5.0 The expellant employed for the dry powder units shall be nitrogen. The capacity of the nitrogen cylinders employed for this purpose shall be adequate to ensure complete discharge of the dry powder contents at a rate of not less than 2.25 kg/s from each units. A **well-designed pressure control system** shall be provided to regulate the pressure of nitrogen gas and maintain a constant powder discharge pressure throughout operation of the unit.
- 10.6.0 The dry powder unit shall have a discharge outlet fitted with not less than 22 m of minimum 25 mm bore hose terminating in a trigger control shut-off nozzle, capable of producing either a straight jet or fan-spray pattern of discharge. The range of jet shall be not less than 12 m.
- 10.7.0 The hose and nozzle shall be stowed suitably in lockers on either side of the appliance to facilitate speedy run out on arrival at an accident.

#### **11.0.0 ACCEPTANCE TESTS**

The following acceptance tests on various equipment shall be conducted to meet guaranteed parameters and shall be carried out in accordance with relevant I S Code.

- a) Pump test
- b) Primer test
- c) Road test
- d) Stability

#### **(B) DESCRIPTION OF FIRE WATER TENDER**

#### **12.0.0 VEHICLE CHASSIS**



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The chassis for carrying out fabrication work of fire water tender shall be of Make-TATA/Ashok Leyland/Eicher/equivalent. The chassis shall be equipped with power assisted steering and power brake. Chassis shall be BS-IV compliant.

### 13.0.0 GENERAL REQUIREMENTS

#### **The vehicle shall be built conforming to IS 950: 2012**

#### 13.1.0 The appliance shall incorporate:

##### a) For variant -1 as per S.NO. 1.1.2:

High and low pressure fire pump of capacity (4000 LPM @ 0.7 Mpa and 300 LPM @ 3.5 Mpa), The appliance shall carry a water tank of minimum 7000 Liter capacity.

It shall carry an extension ladder and shall be capable of towing a trailer pump.

#### 13.2.0 The water tender shall be fabricated in a manner so as to conform to the following characteristics:

- |    |                                                                                                                                                                                                                                                                                                                  |                                                                       |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| a) | Gross vehicle weight                                                                                                                                                                                                                                                                                             | not less than <b>25000 kg including crew,</b><br>water and equipment. |
| b) | Maximum speed on level road<br>fully laden.                                                                                                                                                                                                                                                                      | 72 km/h                                                               |
| c) | Acceleration from a standing<br>start through the gears (fully laden)                                                                                                                                                                                                                                            | 64 km/h in 55 second                                                  |
| d) | The appliance shall be capable of being started from rest on a gradient of 1 to 4.                                                                                                                                                                                                                               |                                                                       |
| e) | When travelling at 48 km/h on a level dry surface the foot brake shall be capable of stopping the vehicle within a distance of 15 m from the point at which the brake is applied. The hand brake shall be capable of holding the fully laden appliance on a dry surface gradient of 1 in 4 when in neutral gear. |                                                                       |
| f) | The appliance shall have the following overall dimensions:                                                                                                                                                                                                                                                       |                                                                       |
|    | Wheel base                                                                                                                                                                                                                                                                                                       | Not more than 4500 mm                                                 |
|    | Turning circle                                                                                                                                                                                                                                                                                                   | Not more than 20 m                                                    |
|    | Road clearance                                                                                                                                                                                                                                                                                                   | Not less than 230mm                                                   |
|    | Overall width                                                                                                                                                                                                                                                                                                    | Not more than 2.50 m                                                  |

**Note: - The chassis shall meet the prevailing emission norms and shall totally comply with the Central Motor Vehicle Rules.**

- 13.3.0 All parts, which shall form waterways or come into contact with water shall be of corrosion-resisting material or should be made of material duly treated for anti-corrosion. All metal parts exposed to atmosphere shall either be of corrosion-resisting material or treated.



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13.4.0 Lubricating nipples shall be provided wherever necessary.

**14.0.0 DESIGN AND CONSTRUCTION**

**14.1.0 Engine**

14.1.1 The engine shall be provided with cooling system to permit its continuous stationery running without overheating. Indirect cooling system shall be incorporated, if necessary, which shall be of the open circuit type discharging water to the waste. Arrangements shall be made to divert the cooling discharge water to water tank, if necessary.

14.1.2 The operating temperature of the engine cooling water shall preferably be thermostatically controlled.

14.1.3 The oil in the oil sump shall be prevented from overheating.

14.1.4 Suitable gauge for cooling water and glow lamp for lubricating system shall be provided in the driver's cab and on the pump panel. This shall be marked with operating temperature.

14.1.5 External filter shall be provided for the lubricating system and a tubular dip-stick to gauge the level of oil in the oil sump shall be provided.

14.1.6 The heat exchanger tank shall be made from minimum 1.22 mm thick mass sheet 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 for the operating temperature specified by the chassis manufacturer when the vehicle is being tested in stationary conditions.

**14.2.0 Electrical System**

14.2.1 A trickle type battery charge shall be provided for recharging the battery *in situ*. A red pilot lamp, indicating when the batteries are being charged from an external supply, shall be provided.

14.2.2 All important electrical circuits shall have separate fuses suitably indicated and shall be grouped into a common fuse-box located in an accessible position from driver's cab and fitted with means for carrying spare fuses. The wiring shall be single pole and shall not be exposed to the atmosphere. Conduits shall be used wherever necessary.

**14.3.0 Water Tank - It shall have capacity of 7000 ltr. as per latest IS-950.**

14.3.1 A single tank shall be used with a capacity indicated above. The tank body and baffles shall be of minimum 5 mm thick mild steel plates. The tank shall be mounted on the chassis and suitably baffled in a manner keeping in view the proper load distribution on the axles. The baffling provided in the tank shall be able 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 tank shall



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be mounted on the vehicles using metacone mounting. U-bolts shall not be used in the vehicle. 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.

- 14.3.2 The tank shall be fitted with a 50 mm bore overflow pipe. A 63 mm instantaneous hydrant connection, incorporating a strainer, 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 pipe line shall be taken from the tank to the suction inlet of the pump incorporating minimum 100 mm quick action spherical type valve. Separate valve(s) for performing the function given in 14.3.6 shall be provided to control the flow of water to the hose reel equipment. Drain plugs or drain cocks shall be provided, wherever necessary.
- 14.3.3 The tank shall be given adequate anti-corrosive epoxy treatment consisting of one coat of primer with two coats of finish paint after preparing the surface by sand 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.
- 14.3.4 Dial gauge water level indicator for the tank shall be provided preferably in the driver's cab or a visual level gauge of the glass tube shall be provided at the control panel calibrated 1/4, 1/2, 3/4 and full (preferably calibrated in liters).
- 14.3.5 The tank shall have a bolted manhole of 450 mm diameter minimum and shall have a threaded ring and cap of 300 mm diameter for filling the water tank from the top. The manhole cover shall be made from 5 mm thick mild steel plate and epoxy coated from inside and outside. A cleaning hole of at least 250 mm diameter shall also be provided at the bottom.
- 14.3.6 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 operation are possible
- Hydrant - tank,
  - Hydrant - reel,
  - Tank-pump-high and low pressure hose reel,
  - Hydrant- pump- high and low pressure hose reel, and
  - Tank-Pump-Monitor
  - Off.
- 14.3.7 The tank shall be connected to the pump and hose reel in such a manner that pressurization of water tank or water tank pump connection is not possible when pumping water from an outside source of supply.
- 14.3.8 The plumbing between pump and hose reel shall have a clear and unobstructed water way of not less than 25 mm throughout without any obstruction.



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#### 14.4.0 **Hose Reel**

- 14.4.1 Two nos. hose reel (conforming to IS: 884) shall be provided at the rear of the appliance with 60 m lengths of 20 mm bore hose connected by screw 'C' type quick release couplings and terminating with a control branch and fog nozzle. The reel shall be fitted with over brake or locking device. The gun shall be of constant flow type and shall have a discharge capacity of 150 litre/min approximately. Provision shall be made in the gun controls to achieve combat mode (straight jet) or a fog shield in split second. The fog gun shall be made of stainless steel or aluminum alloy.

#### 14.5.0 **Pump**

- 14.5.1 A centrifugal pump high and low pressure pump shall be mounted at rear side of the appliance. The low and high pressure sections of the pump may be either single-stage or multi stage type. Anti-friction bearings external to the casing be provided so as to avoid any bearings within the pump casing. The bearing used in the pump shall be of reputed make. The gland shall be of the mechanical self-adjusting type. The pump shall be provided with in-built filter assembly of easily removable type, which shall filter the water before entering into pressure stage impeller. A filter capable of filtering particle size up to 0.75 mm or less shall be used. This filter shall be of stainless steel and shall be easily accessible for cleaning.

The normal and high pressure impeller shall be mounted on a single shaft. The impeller(s) of the low pressure section shall be closed type and shall be dynamically balanced. The impeller(s) of the high pressure section shall be closed or regenerative type. A drain cock plug shall be provided at the bottom of the casing in a way to prevent the cock being opened due to vibrations. Studs, bolts etc., used in the pump casing coming in contact with the water shall be of stainless steel. The castings shall be without any blow holes, internal cracks, etc. The interior of the casting shall be smooth finished. The castings shall withstand the hydraulic pressure as specified against Cl. No. 14.5.5.

The bearing housing will be made of C.I. the delivery outlet, delivery valves and high pressure circuitry shall be made of Gun metal conforming to Gr.II of IS:318.

The pump shall be provided inbuilt (integrated in the pump outlet manifold) pressure relief valve which shall operate automatically and shall not allow the high pressure to increase beyond 45 Kg/cm<sup>2</sup>.

- 14.5.2 The pump shall be completely covered. However, all the controls on the panel and the gauges shall be uncovered.

The pump shall be coupled to the prime-mover of the chassis through a power take-off (PTO) capable of transmitting full torque of the engine used for the appliance. All propeller shafts and all fittings used for coupling the PTO, pump, etc., shall be of the same size and type as used by the chassis manufacturer for the drive line.

The PTO shall have a step up gear ratio of not less than 1:1.27. A cooling coil made of copper pipe shall be provided in the bottom of the PTO casing.



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A control lever for engaging and disengaging the pump, with suitable locking devices, shall be provided in the driver's cab.

- 14.5.3 The pump shall be designed to give its rated output with an engine and pump input at shaft speed safe enough to operate the engine. The pump shall give performance as detailed below when working with strainers (except basket strainer) at  $27 \pm 2$  °C.:

The pump shall be capable of delivering 4000 LPM @ 7 Kg/cm<sup>2</sup> and 300 LPM @ 35 Kg/cm<sup>2</sup> at 3 mtrs. suction lift at NTP condition.

The pump shall follow the following performance parameters:

|                                          |                                                                      |
|------------------------------------------|----------------------------------------------------------------------|
| Normal Pressure Output                   | :4000 LPM @ 7 Kg/cm <sup>2</sup>                                     |
| High pressure Output                     | : 300 LPM @ 35 Kg/cm <sup>2</sup>                                    |
| Maximum Pressure in Normal Pressure mode | : 14 Kg/cm <sup>2</sup> (shut off pressure)                          |
| Maximum Pressure in High Pressure mode   | : 45 Kg/cm <sup>2</sup>                                              |
| Deep Lifting Capacity of Pump            | : 30 m <sup>3</sup> /sec max. up to 7 M in 30 Sec. at NTP conditions |

The above performance data shall be considered when working through 2.45 m lengths of specified suction hose.

The design of pump shall be such that the normal pressure and high pressure stages can be operated simultaneously. Simple mechanism shall be provided to change over from normal pressure to high pressure, preferably a single lever operation. However, at any given pump/engine speed, the low pressure registered shall not exceed 1/4<sup>th</sup> (one quarter) of the registered high pressure.

A thermal relief valve (TRV) shall be fitted on the pump discharge side which will control the water temperature within the pump below 48°C (or 80°C – this version shall be used only when there is good operational reason) when the pump is operating in high rpm with closed discharge. The water discharged from the TRV shall be either taken back to water tank or safely piped away to waste with metallic pipe.

The pump housing shall have provision to connect normal pressure hose reel and cooling water line.

The efficiency of the pump shall be such that the power and the RPM required shall not be more than that available with the engine.

- 14.5.4 The material of construction for pump & its control panel shall be as follows:

- |    |                                       |                                        |
|----|---------------------------------------|----------------------------------------|
| a) | Pump casing and low pressure impeller | Lead tin bronze (Grade LTB2 of IS:318) |
|----|---------------------------------------|----------------------------------------|



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- |    |                                      |                                                                                           |
|----|--------------------------------------|-------------------------------------------------------------------------------------------|
| b) | High pressure impeller               | Phosphorous-bronze or stainless steel or aluminum bronze ( IS 617)                        |
| c) | Impeller ring and impeller neck ring | Lead tin bronze (Grade LTB2 of IS: 318)                                                   |
| d) | Pump shaft                           | Stainless steel (Grade 04Cr18Ni10 of IS: 6603).                                           |
| e) | Pump panel                           | Aluminum sheets/ chequered plates ( IS 737) or mild steel sheets (IS: 513 ordinary grade) |

#### 14.5.5 Pump Test

When tested in accordance with pump specification, the efficiency shall not deviate from the value specified by the pump manufacturer by more than  $\pm 5\%$ . However, in no case the efficiency of the pump shall be less than 60 percent. The pump shall run for a period of 3 hours non-stop delivering the rated output at 0.7MPa and for 1 hour at 3.5 MPa with a lift of 3 m.

The pump shall be run dry for a period of minimum two minutes at 2000 RPM to check the integrity of the mechanical carbon seal. After this test there shall not be any leakage of water through carbon seal.

During the test the water shall not be replenished for the cooling system and the temperature of the engine oil should not exceed 115°C or of the engine manufacturer rated temperature for continuous working whichever is less. 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. The PTO sump oil temperature shall not exceed 100 percent of the manufacturers recommended temperature for the grade of oil used. The pump casing and impeller shall be subjected to a hydraulic pressure of 2.1 MPa to detect leakage, perforation, etc. Foam induction test shall be done to check calibration of the metering valve.

#### 14.6.0 Suction inlet and Delivery Valves

14.6.1 The pump shall have suction inlet(s) having 125 mm standard suction connection as per IS: 902 with internal strainer(s) and blank cap(s). The strainer(s) shall be retained firmly when in use but shall be easily removable. The mesh size of the pump inlet screen shall be smaller than the outlet size of the impeller.

14.6.2 The pump shall be provided with 4 delivery valves for the 4000 litres/min pump having 63 mm standard hose couplings as per IS: 903 with screwed wheel type quick closing clack valve conforming to IS: 4928. Blank caps fastened with chains and incorporating means to relieve pressure between the valve and the cap shall be provided one for each delivery valve.

#### 14.7.0 Primer



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- 14.7.1 The primer shall be capable of lifting water at least 7.0 m (measured from water level to the center of pump) in not more than 24 seconds and shall preferably be fully automatic. The allowance shall be 30 cm for every 300 m elevation above sea level and 1 percent for 2.5°C rise in water temperature.
- 14.7.2 If case of the reciprocating type primer, means shall be provided to automatically limit the speed of engine while the primer is engaged.
- 14.7.3 The primer shall be constructed of gun metal/light alloy casting, shall have stainless steel shaft and shall be fitted with suitable lubricated bearing depending upon the type of primer. The caps of primer and springs shall be properly secured. The primer lever shall be easily accessible from the operator(s) position.
- 14.7.4 In the case of reciprocating type, the primer shall be preferably designed with a view to primer when the pump is running at speed of 1000 to 1500 rpm. The primer shall disengage automatically at pump pressure of 1.5 to 2.0 bars without manual intervention.
- 14.8.0 **Water/Foam Monitor**
- One water-cum-foam monitor shall be provided on the top at suitable location. The monitor shall conform to IS 8442.
- 14.9.0 **Control Panels**
- 14.9.1 Adequately illuminated control panel shall be provided and positioned as follows:
- a) Rear mounted pump - One control panel at the rear of the appliance.
- 14.9.2 The control panel(s) shall include the following:
- a) Throttle control for engine;
- b) Pressure gauge -0 to 2 MPa  
Pressure gauge – 0 to 5 MPa
- c) Compound gauge calibrated as under:  
Vacuum - 0 to 75 cm Hg, preferably in black;  
Pressure - 0 to 0.6 MPa preferably in black;
- d) Primer control (if the primer is not fully automatic)
- e) Gauge for cooling water and glow lamp for lubricating system;
- f) Cooling water circuit control.
- g) Control for using monitor.
- 14.9.3 The following shall also be provided at a convenient position near the control panel(s):
- a) Water level indicator as described under cl.no. 14.3.4



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- b) Five way control valve as described under cl.no. 14.3.6
- c) Hydrant connections.

#### 14.10.0 **Body Work and Stowage**

##### 14.10.1 Cabin

- 14.10.1.1 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 shall be independent. The driver's seat shall be adjustable and comfortable. The rear compartment of driver's cabin shall have one removable seat for full width of cab for 5 (five) crew members. The cab floor shall be covered with 3 mm thick aluminium chequered plate rigidly fixed to the frame cross members by means of nuts and bolts or riveting. Trap doors for topping up oil, etc, wherever necessary shall be provided.

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

- 14.10.1.2 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 crew members. All the doors shall be fitted on the super structural members, each hung upon three invisible coach type mild steel stout hinges and fitted with best quality handles.

- 14.10.1.3 The door handle on outside of driver seat shall have a locking arrangement. Other doors shall be lockable from inside. In addition to the door lock, aluminum tower bolt of 20 mm shall be provided for all the doors from inside, adequate grab rails shall be provided for easily boarding and alighting from the appliance. 5.11.1.5 The windscreen glass shall be provided in the two valves and shall be flat 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.

##### 14.10.2 Seats

- 14.10.2.1 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.

- 14.10.2.2 Below the crew seat, two lockers shall be provided. One locker for battery box to accommodate two 12 V 13 plates batteries and another for keeping accessories. The extra length of battery cable shall be provided by manufacturer.

- 14.10.2.3 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 fireman, covered with 75 mm × 50 mm cushion latex foam rubber upholstered in good quality foam leather of approved shade.



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14.10.2.4 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.

**14.10.3 Rear Body**

14.10.3.1 The rear body shall be fabricated in continuation and in line. The under frame crew members shall be fabricated from the rolled mild steel channel of 100 mm × 50 mm × 5 mm size. The mild steel runner of 100 mm × 50 mm × 5 mm size shall be provided over 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' clamps with aluminum packing block and self-locking unit. Balata packing of thickness 12 mm shall be provided in between the chassis frame and across members.

**14.10.4 Super Structure**

14.10.4.1 The super structural of the cabin shall be constructed out of 2 mm mild steel 45 mm × 45 mm × 20 mm pressed 'Top Hat' sections. The super structure shall be strengthened specifically on the members with the lockers doors frames are to be fitted and also the other members by providing brackets and gussets of 2 mm mild steel plate securely welded. The details of super structure are as follows: Under frame cross: 100 mm × 50 mm members × 5 mm Floor longitudinal : 50 mm × 50 mm members × 6 mm Vertical members on even : 45 mm × 45 mm side × 20 mm Skirt member : 45 mm × 45 mm × 20 mm Waist member : 45 mm × 45 mm × 20 mm Top deck longitudinal : 45 mm × 45 mm × 20 mm.

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

14.10.4.3 The structure/frame work shall be of welded constructions and made from 2 mm thick mild steel pressed sections and square tubes. The angles and channels used shall be of minimum 3 mm 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.

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

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

14.10.4.6 The entire roof of the vehicle, cabin floor and locker floor shall be covered with minimum 1.60 mm thick aluminium chequered plates. All the lockers sides and complete rear of the vehicle shall be covered with minimum 1.22 mm thick aluminium chequered plates.

14.10.4.7 Lockers shall be provided for secure stowage of all equipment given in Annex B. The height of the lockers from the bottom to the top of the opening shall be not less than 600 mm and the depth shall be not less than 600 mm. All lockers shall be provided with internal automatic lighting arrangement with the master switch in the cab.



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14.10.4.8 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 fire fighting material. These roller shutters shall 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 shall 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 shall be durable, maintenance free, weather and corrosion resistant.

14.10.4.9 Suitable storage space shall be provided to store four 2.5 m lengths of suction hoses in convenient location.

**14.11.0 Miscellaneous**

14.11.1 A suitable bumper shall be provided at the rear rigidly fixed to the super structural members by means of nuts and bolts, fabricated from 100 mm × 50 mm × 5 mm mild steel channel.

14.11.2 Two cat ladders made out of stainless steel round or square pipe of 25 mm diameter shall be provided.

14.11.3 Two numbers of 25 mm diameter aluminum pipe railing with sufficient number of aluminum double socket brackets shall be provided to the rear body over the deck.

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

14.11.5 Quick removable type wire mesh guard made from 25 mm × 25 mm size mild steel wire mesh of 1.6 mm covered in mild steel angle frame shall be provided to all the glasses of driver-cum-crew cabin.

14.11.6 Provision for Stowage of Equipments for all water 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 item damage the internal paneling and thereby increase the life of the vehicle. Suitable clamps, brackets, holders, etc. are provided for all other items.

14.11.7 **Cable Winch**  
An electrically operated cable winch of 6 t capacity shall be provided. The winch unit shall be complete with minimum 5.5 HP 12 V dc series wound electric reversible motor for increased pulling power, rope drum, and 27 m heavy duty galvanized EIPS wire rope with replaceable self-locking clevis hook and shall be mounted on the front bumper of the vehicle with suitable strong supports.

14.11.8 Telescopic Light Mast or Inflatable Emergency Lighting System



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A compact, low profile, roof mounted lighting system, fitted with  $4 \times 1\,000$  W metal halide lamps, vertically elevated pneumatically up to 4.6 m shall be installed on the roof of the vehicle. Lighting shall be provided by a 12 V or 24 V dc with remote control, directional lighting system with rotation and tilt lamps to provide total coverage. The remote control unit shall allow a person to operate all the functions of the light mast or inflatable emergency lighting system and 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. The complete unit shall comprise of hand held remote control with cable, rotation and tilt positioner, mounting frame with built-in tilt system.

**14.11.9 Alternator Unit**

A 6.5 kVA capacity portable diesel engine driven generator unit shall be mounted at suitable location with all necessary connections and control panel for providing power to the light mast as well as other electrically operated tools.

**14.11.10 Ladder Gallows**

Gallows shall be provided to carry a 10.5 m, aluminium trussed type extension ladder. The design shall be such that the ladder can be released without difficulty from a reasonably accessible position and shall embody rollers to permit easy withdrawal by one man. Means shall also be provided for locking the ladder when stowed.

**14.11.11 Tool-Kit Container**

A specially fitted recessed tray for the normal kit of tools, carried on the appliance, shall be provided.

**14.11.12 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  $30^\circ$  from the horizontal.

**15.0.0 WORKMANSHIP AND FINISH**

15.1.0 All parts of the appliance shall be of good workmanship and shall have streamlined finish.

15.2.0 The appliance shall be painted fire red colour conforming to Shade No. 536 of IS:5. The paint shall conform to IS: 2932

**16.0.0 ACCESSORIES**

16.1.0 The following accessories shall be provided in addition to those normally fitted on modern commercial vehicles:

- a) Fire bells - 250 mm diameter fire bell shall be mounted externally and shall be capable of being operated from within the driving compartment. The bell shall be of the hand-operated type.
- b) Head lamps - Two.



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- c) Fog lamps - Two.
- d) Reversing light - Lamp suitably situated to assist reversing.
- e) Amber blinkers lights - Situated on the head of the driving compartment.
- f) Trafficators - Illuminated with indicating lights on instrument panel or in any other prominent position in driving compartment.
- g) Wind screen wipers electrically operated.
- h) Tools - All tools required for normal routine maintenance of the appliance, which are not included in the kit for the chassis.
- j) Siren - Battery operated.
- k) Search light - Adjustable to give flood or beam light, mounted in a convenient position but capable of being readily disconnected and mounted on a tripod away from the appliance, complete with tripod and with not less than 30 mm of TRS cable on a reel mounted on the appliance.
- m) Spot light - Adjustable, mounted in a convenient position on the near side of the driving compartment.
- n) Inspection lamp - Protected type on wander lead with plug. A socket shall be provided in the control panel in the driver's cab for plugging in the lamp.
- p) Tail lamps - Two of combined stop and tail.
- q) Rear reflectors
- r) Wind Screen Washer
- s) Cab, instrument panel and locker, light
- t) Public address system.

**17.0.0 INSTRUCTION BOOK, ACCESSORIES AND EQUIPMENT**

**17.1.0 Instruction Book or Books**

Instruction book(s) for the guidance of the user(s), including both operating and normal maintenance procedure shall be supplied. The book(s) shall include an itemized and illustrated spare parts list giving reference numbers of all the wearing parts. Further refer IS 950:2012.

**18.0.0 MARKING**

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

- a) Manufacturer's name, or trade-mark, if any



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- b) Serial number of the pump body and year of construction
- c) Capacity of pump, in l/min
- d) Capacity of water tank, in litre
- e) Nominal speed, in rev/min
- f) Transmission ratio of the pump gear
- g) Working pressure, in kg/cm<sup>2</sup>
- h) Direction of rotation of the pump shall be indicated by an arrow and this shall be permanently marked on the pump body
- i) Lubrication points, drainage devices, etc, shall be color coded.

**19.0.0 ADDITIONAL ACCESSORIES** (over & above accessories mentioned against Cl.16.0.0)

The additional accessories that are normally required to assist in operation of appliance are detailed in enclosed **Annexure-II**. Bidder to include these accessories in their scope of supply.

**20.0.0 ACCEPTANCE TESTS**

The following acceptance tests on various equipment shall be conducted to meet guaranteed parameters and shall be carried out in accordance with relevant IS Code.

- a) Pump test
- b) Primer test
- c) Road test
- d) Stability
- e) Any other test as specified in IS 950:2012 & latest.

**C. DESCRIPTION OF FIRE JEEP**

**21.0.0 FIRE JEEP**

Fire Jeep to be supplied shall be of Mahindra Bolero Make, model SLE BS IV (05 seater). Fire jeep shall have 1.5T capacity tow hook at the rear of the vehicle. One number, 50mm circumference, 15m length manila rope as per IS: 1084 shall also be supplied with Fire Jeep.



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**D. DESCRIPTION OF ROAD AMBULANCE**

**22.0.0** The Ambulance shall be supplied from such manufacturer who have manufactured and supplied at least one (1) number Road Ambulance, which is in successful operation. To establish the provenness supplier to submit the Performance certificate (along with copy of relevant purchase order) from the end user certifying that the referred Ambulance is in successful operation.

**23.0.0 VEHICLE CHASSIS**

The chassis for carrying out fabrication work of road ambulance shall be of Make-TATA SFC 407 Ex / 31 WB BS IV TT. The chassis shall be equipped with power assisted steering and power brake. Chassis shall be BS-IV compliant.

**24.0.0 VEHICLE CHARACTERISTICS**

**24.1.0 General Construction**

The road ambulance shall comply with all the requirement of Type B, patient transport vehicle as per AIS 125 and other requirements mentioned in the section.

The rear body shall be in continuation and in line. Structural material used for the fabrication of ambulance shall be new and free from all rust and scales. Strength and size of structural material shall be such that performance and safety requirement of ambulance as per AIS 125 are meet. The structure shall be so designed so as to avoid any vibration/ratting/deformation in the intended usage of the vehicle.

The design of the vehicle and the specified equipment shall permit accessibility for servicing, replacement, and adjustment of component parts and accessories with minimum disturbance to other components and systems.

**24.2.0 Vehicle Body**

24.2.1 All interior materials shall comply with the flammability requirements specified in IS: 15061.

24.2.2 The ambulance shall be equipped with two fire extinguishers of 2 Kg each.

24.2.3 The minimum loading capacity shall be as mentioned below:

Driver seat: 01

Co-driver: 01

EMT: 01

Stretcher: 01

Patient attendant: 04.

24.2.4 Partition wall with a window separating the driver's compartment from the patient's compartment shall be provided. Partition wall material shall complying with the requirements of CMVR. The windows shall allow direct visual contact with the driver. The opening area of the window shall have a maximum area of 0,12 m<sup>2</sup>. It shall be secured against self-opening and shall have an adjustable blind or other means of preventing the driver being disturbed by the light of the patient's compartment.

24.2.5 Rear Door:

Centrally Divided rear doors on high quality steel hinges ensuring 270 degree opening for both the doors shall be provided. In the fully open condition the doors must get latched rigidly to the outer surface of the side-wall of the body on the respective sides. It must be mandatory to manually release the latch levers to free the doors for closing.

Both the rear doors should be provided with full width fixed windows made from toughened glass approved for automotive use.



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Door of the patient's compartment shall be fitted with a security system which enables the following:

- a) Lock and unlock from inside without use of a key.
- b) Lock and unlock from outside with use of a key.
- c) Unlock from the outside using a key when the door is locked from the inside.

There should be a full width rear footstep entry allowing easy entry and exit from the patient compartment.

**24.2.6 Window:**

Window between patient & driver cabin shall be sliding glass window having lock. The window should be made up of extruded aluminum profile in rounded rectangular shape (all the corner edges are curve so that there are no sharp corner edges along the window frame). There should be only one joint in the frame and the inner profiles must have synthetic sliders for smooth movement of the glass panes. The sliding glass should be of toughened glass as needed for automobile applications.

In the patient's compartment, there shall be a minimum of two external windows. The windows shall be positioned or screened to ensure patient's privacy when required. Windows shall be fitted with safety glasses complying with the requirements of IS: 2553.

**25.0.0 Patient compartment**

**25.1.0** The patient compartment shall provide a minimum of 7.7 m<sup>3</sup> space while complying with the following:

The length measured from the partition to the inside edge of the rear loading doors at the floor, shall be at least 3.0m. The width of the patient compartment at the floor level should be at least 1.6m and the height of the patient compartment the height point should be minimum 1.6m.

**25.2.0** Complete interior panelling of the sidewalls, sides of the partition wall between patient cabin and driver cabin, roof & back door panels should made from Acrylonitrile Butadiene Styrene (ABS) Sheets.

**25.3.0** The complete interior should be edgeless and suitable for easy cleaning / scientific fumigation / treatment of disinfectants. The panels must be suitably formed using the appropriate ABS processing technology so as to match to the contour of the vehicle and looks aesthetically pleasing.

**25.4.0** Between the interior conversion panels and the internal surface of the base vehicle body there should be adequate insulation of appropriate grade to have a good climatic control environment inside the vehicles.

**25.5.0 Cabinet for storing medical equipment / supplies / wash basin / dust bin.**

**25.5.1** Placed alongside the left side wall at the front end attached with partisan wall.

**25.5.2** Made of FR and MR grade 19mm thickness plywood of IS: 15061-2002 approved automobile grade (Magnus Chequered plywood IS: 315:64:2010) clad with 01/02 mm ABS sheets.

**25.5.3** Medical Cabinet having sufficient utility and durability for storing medical consumables with in-built wash basin, space for accommodating two waste bins would also be acceptable.

**25.5.4** All the hardware like rails, channels, sliders, locks, catchers, hinges, handles should be of "Ebco", HETTICH or equivalent make. The slide rails are to be of minimum two inches width.

**25.5.5** Stainless Steel (SS) / ABS wash basin with SS water tap supplying water through Motorized Pump (12 V DC power operated ISI mark submersible, heavy duty) with foot operated control, to pump the water from the fresh water tank to be provided.

**25.5.6** Fresh Water Tank and Drain Water Tank both made of 3mm thick food grade plastic quality with inlet and outlet connection below the wash basin both having 18 Liters capacity to be provided. Drain water tank should be a closed circuit without overflowing to ensure fool proof draining by



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users. Proper space to be provided in fresh water tank for replacement of washbasin pump. Both the Tanks should be easily removable for any sort of Maintenance and Cleaning purpose.

25.5.7 All the drawers should be provided with lock and key of reputed brands to secure them against unintended opening during any kind of possible motion of the ambulance.

25.5.8 Two Concealed Portable Stainless Steel Dust Bins with spring loaded lids for waste disposal are to be provided under the wash basin.

**25.6.0 Squad bench / attendant seat – (with seat belt) with storage of rescue tools**

25.6.1 A squad bench shall be installed along the left hand wall end with outside open able Top Seat (i.e. the 75mm wide hinges to be mounted inside towards Wall on suitable size of steel plate in fabrication)

25.6.2 Made of FR and MR grade 19 mm plywood and clad with ABS sheet of 02 mm, with Mild steel (MS) 32mm angle frame reinforced within, to carry 450 kg weight and mild steel frame to be painted with PU paint.

25.6.3 Dimensions of the bench: length = 1845 mm, width = 500mm, height = 465mm. This shall provide storage space inside the Box below to accommodate Extrication tools within.

25.6.4 The inner box area should be covered with heatlon sheet properly glued to the inner surface.

25.6.5 It should have three suitably placed seat belts of self-adjusting type/ back rest (25mm thick) cushions to be provided.

25.6.6 Squad bench cushion should be minimum 70 mm thick (made from 1 inches heatlon at bottom and 2 inches of cushion at top) or higher density Foam cushion to be provided for comfort and the same should be upholstered with non-absorbent PVC leather cloth of IS - 1259 (class-A, grade I) of silver gray color.

25.6.7 All the seats in vehicles to be provided with non-absorbent PVC leather cloth of IS -1259 (class A, grade I) seat covers (of grey color) with perfect fitting and easy to replace facility.

25.6.8 Steel reinforcement of the squad bench to take direct load on structure rather than ABS panels.

25.6.9 Back rest should be minimum 50 mm thick (made from 1 inch heatlon and 1 inch high cushion foam) should be provided in concurrence with squad bench at the left side wall panel.

**25.7.0 EMT's Seat**

i) At the head end of the patient stretcher the ambulance should have a rear mounted foldable base EMT / Doctor seat.

ii) Dimensions: Depth = 410mm, Width = 540mm and Seat height = 380mm, Back Rest Height = 460mm.

iii) It should have one waist seat belt.

iv) Preferably PU molded seat with powder coated/stainless steel legs.

**25.8.0 Oxygen Cylinder Compartment and delivery System**

The ambulance shall have medical oxygen system as per the detailed mentioned herein.

25.8.1 Oxygen compartment shall be fabricated in such a way that the oxygen cylinders are accessible from outside of the vehicle with separate lockable door.

25.8.2 Oxygen compartment should be dust proof (with frame and rubber profile) and all precautions should be taken to prevent the Dust entering this compartment from all sides and particularly from Door, hence a proper sealing should be provided on door edges.

25.8.3 Two (2) nos jumbo 'D' Type oxygen cylinder along with its mounting trolley are to be provided, trolley shall be designed in such a way that both the cylinders could be handled independently.

25.8.4 High pressure flexible SS braded Teflon tubing with male female bull nose connectors at both end to connect it from the oxygen gas cylinder to the pressure regulator inside.

25.8.5 Two stage Preset Pressure Gauge cum Regulator: With static outlet pressure of 4.12 bar/ 60 psi with two safety valves at each stage; 2 nos each;

25.8.6 Humidifier Bottle: Poly Carbonate Bowl with metal Cap and T type inlet outlet nipples, 2 nos.

25.8.7 Flow Meter: Stainless Steel/ Brass body, Poly carbonate Tube, to regulate the flow from 0 to



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- 15 ltrs per mints. It should be a back pressure compensated;
- 25.8.8 Three plus one (3+1) four ports of Brass 3/8 inches nipple in size be provided in complete one assembly (One set) on a common rectangular Brass Tube (Rail) with two Needle Valves at both the ends. (Ask for Clarification if needed)
- 25.8.9 Two high pressure and two low pressure pipe connection to be made
- 25.9.0 Air conditioning system**  
The patient compartment must be provided with an engine driven air conditioning system of adequate capacity matching to the total heat load of the patient compartment when fully occupied and the patient loaded.  
The compressor should be engine mounted and engine run. All hoses should be machine crimped to avoid the leakages. AC system should be certified for passenger vehicle usage. Both the patient compartment as well as the driver cabin should be air conditioned with separate and individual digital controls.  
There should be no cross ventilation / contamination / free air flow of air between the driver cabin and the patient compartment with the partition wall window closed.
- 25.10.0** Infusion mounting, Hat racks and Grab rails in the ceiling and near Rear door shall be provided as per the details mentioned below:  
**a) Hat Racks:**  
i) Dimension approx: length =1500 to 3000 mm, Depth = 350 to 450 mm at bottom and 200 to 241 mm at ceiling, height = 350 – 360 mm. To be integrated with roof above the squad bench. Made in ABS (min 4 mm thick) and required reinforcement to be provided. It should spread from rear-left top side wall to the front end.  
ii) Inner surface is to be pasted with soft Heatlon sheet of 4mm thickness.  
iii) The Hat rack should have suitable closures to cover the opening which are easy/comfortable to operate and do not have any sharp edge at the openings.  
iv) The doors of the hat rack should have adequate locking system to avoid abnormal opening during operation.  
v) Rear portion should be closed and front should have about 80 mm high wall support provided so material should not fall down  
**b) Grab Rails:**  
i) A 2380mm long pipe of 30mm dia. made of stainless steel (SS) be placed as grab rail on the Ceiling with proper supports at four places;  
ii) A 610mm long pipe of 30mm dia. made of SS is placed as Grab Bar near the LHS rear door at LHS wall with firm support at the ends.  
**c) Infusion Mounting – 02 nos**
- 25.11.0 A proper heavy duty bracket support at rear LHS corner for placing a fire extinguisher should be provided.
- 26.0.0 Electrical System**
- 26.1.0** The ambulance electrical system should be equipped with, but not limited to, the following:  
(i) Dual, OEM's batteries.  
(ii) Generating, starting, lighting, visual and audible warning systems.  
(iii) Specified electronics equipment and devices (including master consoles located in the cab and patient compartment).  
(iv) Other specified accessory wiring.
- All electrical system components and wiring should be readily accessible through access panels.



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All switches, indicators, and controls should be located and installed in a manner that facilitates easy removal and servicing.

All exterior housings of lamps, switches, electronic devices, connectors, and fixtures should be corrosion resistant and weatherproof grade all preferably integrated to the exterior of the vehicle. All electrical devices and equipment installed, including the electromagnetic coils of high current solenoids, and relays etc, which produce RFI, should include filters, suppressers, or shielding to prevent electromagnetic radiation and the resultant interference to radios and other electronic equipment.

#### **26.2.0 Warning Indicators**

The electrical system should, incorporate a warning light panel located in the driver's compartment. It shall provide indicator light as well buzzer for open patient compartment entry doors.

#### **26.3.0 Wiring Installation**

The ambulance body and accessory electrical equipment should be served by circuit(s) separate and distinct from vehicle chassis circuits.

All wiring provided by the supplier should be copper.

All wiring should have high temperature cross-linked polyethylene or better insulation. The use of multi conductor or ribbon cables are permitted provided they are not exposed to under hood or under vehicle temperatures/conditions.

The wiring should be permanently color coded or marked for the entire length of the wire.

Wiring should be routed in conduit or appropriate looms.

When cables are supplied by a component manufacturer to interconnect system components, these cables need not be continuously color coded/identified. They should be coded / identified at the termination or interconnection points.

All added wiring should be located in accessible, enclosed, protected locations and kept at least 150mm. away from exhaust system components.

Electrical wiring and components should not terminate in the oxygen storage compartment except for the oxygen controlled solenoid, compartment light, and switch / sensor plunger or trigger device. Wiring necessarily passing through an oxygen compartment should be appropriately protected from damage.

All conduits, looms, and wiring should be secured to the body or frame with insulated cable straps.

All apertures on the vehicle should be properly grommited for passing wiring. All items used for protecting or securing the wiring should be appropriate for the specific application and be standard automotive, aircraft, marine, or electronic hardware.

Cable ties should not be used to support harnesses, but may be used for bundling purposes.

Electrical panels that are accessible to accidental contact should have a protective cover, shield, etc. to prevent shorts that can result in injury, fire, or damage to the electrical system.

#### **26.4.0 Wiring Criteria**

All wiring (including grounds), devices, switches, outlets, etc., except circuit breakers, should be rated to carry at least 125% of the maximum ampere load.

A service loop of wire or harness should be provided as required at electrical components, terminals, and connection points.

All splices and terminals provided should comply with applicable standards meant for specific applications.

All terminals should be permanently numbered or coded.

Terminal strip(s) block(s), or multi-pin connector(s) should be readily accessible for checking and service.

All exterior wiring to lights or any other component should utilize sealed connectors or splices.

The ambulance electrical system should incorporate a master circuit breaker or other electronic, non-disposable, current protection devices, in each circuit, which comply with specific application. (if circuit breaker is used it should be readily accessible for resetting by the driver).

When multi-conductor cables / ribbon cables are used for low current (self-limiting) circuits, additional fuses / circuit breakers are not required.



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All circuit breakers should be securely mounted, easily removable, and readily accessible for inspection and service.

All electrical and electronic components, switches, connectors, circuit breakers, lamps, indicators, including the vehicle batteries, should be marked with an easily read identification code number and / or letter.

**26.5.0 Grounding**

Dedicated grounds for the appliances, circuits, etc. should be furnished. The use of appliance mounting screws / hardware should not be used for grounding purposes unless specifically designed for such use by the appliance manufacturer.

**26.6.0 Emergency Light Bar cum Public Address System**

Emergency Light Bar cum Public Address System at the top of the vehicle on the front end shall be provided. The layout should comprise of LED flashing lights. Each light bar should have minimum four high intensity LED flashers and a speaker in the centre.

The light bar control unit must have all the necessary control for the various components of the light bar. It must have a microphone. The control unit should be connected to the light bar via the connecting wires all inside a master wire sleeve. It should have variable tones like Wail, Yelp, Siren, Manual etc.

The operational voltage should be 12V DC.

The power consumption should be maximum 100W. All the controls should be provided on the driver's console.

**26.7.0 External Lights & Flashers**

There should be minimum six nos. of high intensity LED flashers in pair of red and orange on either side and rear.

On each side there should be at least one and on the rear side at least two LED white light for general lighting the area outside the ambulance in case of dark evacuations.

**26.8.0 Cabin Lighting & Electrical**

There should be minimum four nos. of 12V / 36W lighting elements in the patient compartment emitting white light meant for general lighting of the compartment.

The lighting fixtures should preferably be seamless in construction without much edges and joineries in the frame and diffuser. There should be three LED spot lamps along the length of the main stretcher for purpose of patient examination.

There should be two 12V DC operated and minimum 6" wall mounted fans one on each side of the patient compartment.

The patient compartment should have minimum 2Nos. of 230V / 6Amp AC Sockets with switches and minimum 4 Nos. of 2\12V DC Sockets for the various medical and general equipments in the ambulance.

The driver cabin should also be supplied with 1No. 230V / 6Amp AC Socket with switch.

The driver cabin should be supplied with a FM Radio Player with two speakers.

**26.9.0 Marking of Switches, Indicators and Control Devices**

All switches, indicators, and control devices supplied by the manufacturer / supplier shall be clearly visible to the driver / co-driver / doctor / EMT / paramedic / squad / attendant or anybody using the ambulance. They shall be perceptively and permanently identified with at least 12 point letters for the noun or function, and 8 point letters for the remainder of the legend. The identifications shall be contrasting colors etched or engraved in plastic or metal, or printed and laminated in see through plastic, and grouped according to function.

**26.10.0 True sine wave inverter with SMPS Power Supply**

Inverter Capacity - Minimum 600 watts / 800 VA

Waveform: TRUE SINUSOIDAL

Efficiency - 85% Minimum



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Minimum 10 Meter length three core 10 mm. charging wire with male 15Amp. three pin ends to be provided

**26.11.0 External Charging Socket**

There should be a weather protected and spring loaded external charging port with spring loaded lid.

The charging port should allow charging of the ambulance batteries from external AC source when the ambulance is stationary.

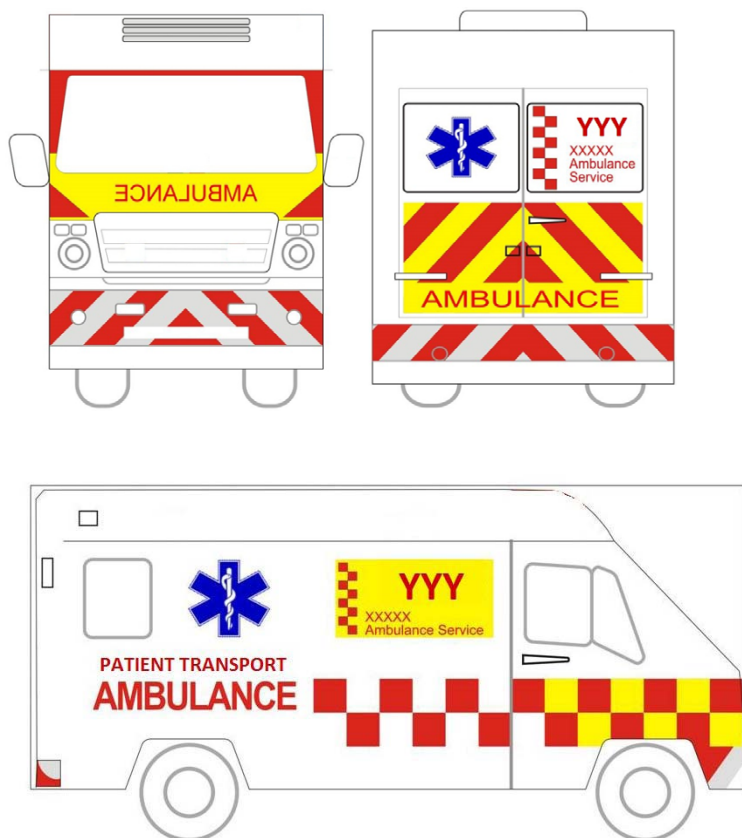
The charging port should be located near the driver door area so that the pilot is aware that the ambulance is connected to external AC source and must be disconnected before moving the ambulance.

**26.12.0 Clock**

A digital clock is to be provided in the patient compartment. It should have a minimum Letter (font) Size of 50 to have better visibility.

**27.0.0 Body graphics and visibility of ambulance**

27.1.0 The ambulance shall closely resemble to the exterior design picture below:





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**27.2.0 Color**

The basic colour of the complete exterior should be brilliant white, RAL-Code 9010, front, rear and side bumpers included. The colour should be weather resistant and withstand daily cleaning and washing.

**27.3.0 Conspicuity improving items**

Shall be as per AIS 125, Type B Ambulance.

**27.4.0 Emblems**

Customer logo and marking shall be done prior to vehicle dispatch and details shall be provided during detailed engineering.

**28.0.0 Equipment to be supplied along with ambulance.**

Below mentioned equipment are to be supplied as minimum, any other equipment not mentioned herein but required to be provided as per AIS 125, Type B ambulance shall also be supplied.

- a) Automatic unloading stretcher as per EN 1865 – 01 no.
- b) Transfer mattress / carrying sheet as per EN 1865 – 02 nos.
- c) Portable oxygen – 1 No. of 2.2L Water Capacity Aluminium Cylinder at maximum 150 kgf/cm<sup>2</sup> filling pressure Manufactured as per IS: 7285 and certified by Chief Controller of Explosives, Nagpur along with its bull nose.
- d) Resuscitator or with oxygen inlet and masks and airways for all ages and oxygen reservoir – 01 number.
- e) Mouth to Mask ventilator with oxygen inlet – 01 no.
- f) Electric Portable Suction Aspirator with air flow of at least 30 L/min and a vacuum level of at least 600 mm Hg (ISO 10079-1-1999) – 01 no.
- g) Portable Suction Aspirator, Manual – 01 no.
- h) Defibrillator with rhythm and patient data recording as per ISO 60601-2-4: 01 no.
- i) Bandaging and nursing material: As per Table 16 of AIS 125 for type B ambulance.
- j) Personal protection equipment: As per Table 17 of AIS 125 for type B ambulance.
- k) Rescue and protection material: As per Table 18 of AIS 125 for type B ambulance.

**E. DESCRIPTION OF FIRE SAFETY EQUIPMENT**

| S.No.     | Description                |   | Detail                                    |
|-----------|----------------------------|---|-------------------------------------------|
| <b>A.</b> | <b>Fiber Glass Blanket</b> | : |                                           |
|           | Make                       | : | Conforming to BS: 476 part 4 and 7.       |
|           | Material                   | : | Fiber glass / Graphite coated fiber glass |
|           | Size                       | : | 6 feet x 6 feet                           |
|           | Quantity                   | : | 06 numbers                                |
| <b>B.</b> | <b>Fire proximity suit</b> | : |                                           |
|           | Make                       | : | Conforming to UL / FM / VdS approved      |



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|           |                                                          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|----------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Material                                                 | : | Multi layered construction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           | Weight                                                   | : | 20 kg to 25 kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|           | Quantity                                                 | : | 02 numbers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>C.</b> | <b>Telescopic ladder</b>                                 | : |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | Material                                                 | : | Heavy duty aluminum alloy                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|           | Extended Height                                          | : | 11.0 m (maximum)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|           | Quantity                                                 | : | 02 numbers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>D.</b> | <b>Self-contained Breathing Apparatus</b>                | : |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | Make                                                     | : | Conforming to UL / FM / VdS / EN approved                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|           | Quantity                                                 | : | 06 numbers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>E.</b> | <b>Canister type mask for chlorine contaminated area</b> | : |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | Make                                                     | : | Conforming to requirements of IS 4263                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|           | Quantity                                                 | : | 04 nos.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>F.</b> | <b>First Aid Kit</b>                                     | : |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | Kit size                                                 | : | 14 inch x 9 inch x 5 inch                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|           | Items inside kit                                         | : | a. Book of instructions on First Aid to injured.<br>b. Copy of First Aid Leaflet issued by the Chief Advisor of Factories, Govt. of India.<br>c. Small Dressing Bandage for finger Wound.<br>d. Medium Dressing Bandage for hands or Feet wound.<br>e. Large Dressing Bandage for Body wound.<br>f. Large Dressing Bandage for Body burn/burn spray.<br>g. Bottle of Antiseptic Solution 50 mls.<br>h. Bottle of Mercurochrome Solution 2% 100 mls N.F.<br>i. Bottle Aromatic Ammonia Spirit 20 |



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|  |          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--|----------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |          |   | <p>MIS B.P.</p> <p>j. Dressing Scissors 5” Stainless Steel.</p> <p>k. Roll of Adhesive Plaster 2.5cm x 1mt U.S.P.</p> <p>l. Pieces of Eye Pad in Separate Packet.</p> <p>m. Packet of 100 Tablets Paracetamol I.P. 0.5 g.</p> <p>n. Tube of Burn Ointment 10 Gms.</p> <p>o. Polythene Wash Bottle for Washing eyes 500 C.C.</p> <p>p. Snake Bite Lancet Stainless Steel Pin. Brass Body with Chrome Plated.</p> <p>q. Packet of Potassium Permanganate 20 Gms I.P.</p> <p>r. Packet of 15 Gms Absorbent Cotton Wool I.P.</p> <p>s. Packet of 20 Gms Boric Acid I.P.</p> <p>t. 50 Nos. Band Aid strip.</p> <p>u. Packet of 20 Gms Soda Bicarbonate. I.P.</p> |
|  | Quantity | : | 02 Sets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IC, Annexure I

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IC**

**ANNEXURE: I**

**SCHEDULE OF EQUIPMENT TO BE SUPPLIED  
WITH FOAM TENDER.**



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

SPEC NO.: **PE-TS-412-550-A001**

SECTION: I

REV: 01

DATE 12.01.2018

SUB-SECTION: IC, Annexure I

**ANNEXURE-I**

List of equipments to be supplied with the foam tender

| S.No. | Equipment / Item                                                                                                                                                                                                                                                                                                         | Quantity   |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1.0   | Extension ladder-10.5 meter (IS: 4571 or IS: 930)                                                                                                                                                                                                                                                                        | 1          |
| 2.0   | Armoured suction hose complete with round thread couplings to suit the pump inlet-2.5 m long (IS: 2410 and IS: 902)                                                                                                                                                                                                      | 4 lengths  |
| 3.0   | Delivery hose, 63 mm, rubber lined in 30 m lengths (type II of IS: 636) complete with instantaneous couplings (IS: 903)                                                                                                                                                                                                  | 10 lengths |
| 4.0   | Suction strainers for item 2.0 (IS: 907)                                                                                                                                                                                                                                                                                 | 1          |
| 5.0   | Basket strainers for item 2.0 (IS: 3582)                                                                                                                                                                                                                                                                                 | 1          |
| 6.0   | Dividing breaching made of light alloy (IS: 905)                                                                                                                                                                                                                                                                         | 2          |
| 7.0   | Collecting breaching made out of light alloy (IS: 905)                                                                                                                                                                                                                                                                   | 2          |
| 8.0   | Suction wrenches (IS: 4643)                                                                                                                                                                                                                                                                                              | 1 pair     |
| 9.0   | Long lines, 50 mm circumference, 30 m long (IS: 1084)                                                                                                                                                                                                                                                                    | 2 lengths  |
| 10.0  | Short lines, 50 mm circumference, 15 m long (IS: 1084)                                                                                                                                                                                                                                                                   | 2 lengths  |
| 11.0  | Hose, bandages, rubberised (IS: 5612)                                                                                                                                                                                                                                                                                    | 12         |
| 12.0  | Hose clamps (IS: 5612)                                                                                                                                                                                                                                                                                                   | 6          |
| 13.0  | Hydrant valve key and bar (IS: 910)                                                                                                                                                                                                                                                                                      | 1 set      |
| 14.0  | Protective clothing for fire men complete with suitable face shield made out of material capable of reflecting at least 95% of radiant heat temperature around 1500 to 2000 degree C and afford some protection against direct flame. The suit will be of sufficient size to accommodate a breathing apparatus to users. | 2 sets     |
| 15.0  | Fog nozzle (IS: 952) with extension applicator to fog head.                                                                                                                                                                                                                                                              | 1          |
| 16.0  | Hand controlled branch for 63 mm size hose coupling.                                                                                                                                                                                                                                                                     | 1          |
| 17.0  | Branch pipe universal (IS: 2871)                                                                                                                                                                                                                                                                                         | 1          |
| 18.0  | Branch with revolving head (IS: 906)                                                                                                                                                                                                                                                                                     | 1          |
| 19.0  | Branch pipes (IS: 903)                                                                                                                                                                                                                                                                                                   | 4          |
| 20.0  | Nozzle of size 12 mm, 16 mm, 20 mm and 32 mm (two each) (IS: 903)                                                                                                                                                                                                                                                        | 10         |
|       | a) Adaptor for 100 mm suction female screw coupling and 63 mm male instantaneous.                                                                                                                                                                                                                                        | 2          |
|       | b) Adaptor double female instantaneous pattern 63 mm.                                                                                                                                                                                                                                                                    | 2          |
|       | c) Adaptor double male instantaneous pattern 63 mm.                                                                                                                                                                                                                                                                      | 2          |
| 21.0  | Nozzle spanners (IS: 903)                                                                                                                                                                                                                                                                                                | 2          |
| 22.0  | Portable electric box lamp with rechargeable accumulator.                                                                                                                                                                                                                                                                | 2          |
| 23.0  | Hand lamp (torch-4 cells)                                                                                                                                                                                                                                                                                                | 2          |
| 24.0  | Flameproof lamp (usable in the present of inflammable gases of vapours)                                                                                                                                                                                                                                                  | 2          |



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

SPEC NO.: **PE-TS-412-550-A001**

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|      |                                                                                                     |        |
|------|-----------------------------------------------------------------------------------------------------|--------|
| 25.0 | Self-contained breathing apparatus (compressed air type) complete with spare cylinder and tool kit. | 1 set  |
| 26.0 | First aid box for ten persons.                                                                      | 1      |
| 27.0 | Rubber gloves (in case) (IS: 4770)                                                                  | 1 pair |
| 28.0 | Asbestos gauntlets (in case)                                                                        | 1 pair |
| 29.0 | Axe, large (IS: 703)                                                                                | 1      |
| 30.0 | Spade                                                                                               | 1      |
| 31.0 | Pick axe (IS: 273)                                                                                  | 1      |
| 32.0 | Crow bar (IS: 703)                                                                                  | 1      |
| 33.0 | Sledge hammer, 6.5 kg (IS: 841)                                                                     | 1      |
| 34.0 | Carpenter's saw, 60 cm (IS: 5098)                                                                   | 1      |
| 35.0 | Hydraulic jack-7.5 tonne.                                                                           | 1      |
| 36.0 | Fire hook (IS: 927)                                                                                 | 1      |
| 37.0 | Tool kit                                                                                            | 1      |



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IC, Annexure II

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IC**

**ANNEXURE: II**

**SCHEDULE OF EQUIPMENT TO BE SUPPLIED  
WITH FIRE WATER TENDER.**



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

SPEC NO.: PE-TS-412-550-A001

SECTION: I

REV NO: 01

DATE 12.01.2018

SUB-SECTION: IC, ANNEXURE II

**ANNEXURE-II**

List of equipments to be supplied with the fire water tender

| S.No. | Equipment / Item                                                                                                                          | Quantity |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1.0   | Aluminium Extension ladder –10.5 m (IS 4571)                                                                                              | 01       |
| 2.0   | a) Rubber lined delivery hose according to Type-II of IS: 636 in 22.5m or 15 m length fitted with 63 mm delivery hose couplings (IS: 903) | 180 m    |
|       | b) Unlined flax canvas hose according to IS 4927 in 30m lengths fitted with delivery hose coupling ( as per IS 903)                       | 150 m    |
|       | c) Controlled percolating hose as per IS8423 in 30 m lengths fitted with delivery hose couplings ( as per IS 903)                         | 150 m    |
| 3.0   | a) Hose clamps (IS: 5612, part-1)                                                                                                         | 25       |
|       | b) Hose bandages (IS: 5612, part-II)                                                                                                      | 25       |
|       | c) Hose slings                                                                                                                            | 20       |
|       | d) Hose straps                                                                                                                            | 20       |
| 4.0   | Suction hose of rubber of 100 mm internal Diameter in 2.5 m length (IS: 2410) fitted with 100 mm suction hose couplings (as per IS 902).  | 10 m     |
| 5.0   | 3 way suction collecting head 100 mm size (IS: 904)                                                                                       | 01       |
| 6.0   | Suction wrenches for 100mm suction coupling (IS: 4643)                                                                                    | 02       |
| 7.0   | Suction Strainer 100 mm size (IS: 907)                                                                                                    | 01       |
| 8.0   | Basket strainer, cylindrical type (IS: 3582)                                                                                              | 01       |
| 9.0   | Dividing breeching with control instantaneous Pattern 63 mm (IS 5131)                                                                     | 1        |
| 10.0  | Collecting breaching with control instantaneous Pattern 63 mm (IS 905)                                                                    | 01       |
| 11.0  | a) Hydrant-stand pipe-two way (IS: 5714)                                                                                                  | 01       |
|       | b) Double female coupling (IS: 901)                                                                                                       | 02       |
|       | c) Hydrant connection, 63mm female instantaneous pattern delivery coupling at both end. (IS: 901)                                         | 02       |
| 12.0  | Combined key for hydrant, hydrant cover and lower valve ( IS 910)                                                                         | 02       |
| 13.0  | Fog nozzle with extension applicator with fog head (IS: 952)                                                                              | 01       |
| 14.0  | Hand controlled branch for 63 mm size hose coupling                                                                                       | 01       |
| 15.0  | Branch pipe universal (IS: 2871)                                                                                                          | 02       |
| 16.0  | Branch with revolving head (IS: 906)                                                                                                      | 01       |
| 17.0  | Branch pipe (IS 903)                                                                                                                      | 4        |
| 18.0  | Nozzles of sizes 12 mm, 16 mm, 20 mm and 32 mm (two each) (IS: 903)                                                                       | 10       |



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

SPEC NO.: **PE-TS-412-550-A001**

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SUB-SECTION: IC, ANNEXURE II

|      |                                                                                                                                                                                                |                |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 19.0 | a) Adopter for 100 mm suction female screw Coupling and 63 mm male instantaneous<br>b) Adopter double female instantaneous pattern 63 mm<br>c) Adopter double male instantaneous pattern 63 mm | 02<br>02<br>02 |
| 20.0 | Nozzle spanners (IS: 903)                                                                                                                                                                      | 02             |
| 21.0 | Portable electric box lamp with rechargeable accumulator.                                                                                                                                      | 02             |
| 22.0 | Hand lamp (torch – 4 cells)                                                                                                                                                                    | 02             |
| 23.0 | Flame proof lamp (useable in the presence of inflammable gases and vapours.                                                                                                                    | 02             |
| 24.0 | Self-contained breathing apparatus (compressed air type) complete with spare cylinder and tool kit.( IS 10245 Part 2)                                                                          | 1 set          |
| 25.0 | Portable fire extinguisher, dry powder type, 2 kg (IS: 2171)                                                                                                                                   | 01             |
| 26.0 | Foam making branch FB-4 with pick up tube (IS 2097)                                                                                                                                            | 01             |
| 27.0 | Lowering Line: 50 mm hemp or terylene 40 m long having two ends spliced in and one end with a running noose (IS: 1084)                                                                         | 01             |
| 28.0 | Long line, 50mm manila, 30 m long (IS 1084)                                                                                                                                                    | 01             |
| 29.0 | Short line, 50mm manila, 15 m long (IS 1084)                                                                                                                                                   | 01             |
| 30.0 | Canvas buckets                                                                                                                                                                                 | 02             |
| 31.0 | First aid box for 10 persons                                                                                                                                                                   | 01             |
| 32.0 | Insulated plier (IS3650) with rubber gloves pair (IS4770) tested to 20000 volts                                                                                                                | 2 nos.         |
| 33.0 | Asbestos gauntlets                                                                                                                                                                             | 1 pair         |
| 34.0 | Axe large (IS: 703)                                                                                                                                                                            | 01             |
| 35.0 | Spade                                                                                                                                                                                          | 01             |
| 36.0 | Pick Axe (IS: 273)                                                                                                                                                                             | 01             |
| 37.0 | Crow Bar (IS: 704)                                                                                                                                                                             | 01             |
| 38.0 | Sledge Hammer (IS: 841) –6.5 Kg                                                                                                                                                                | 01             |
| 39.0 | Carpenter saw 60 cm (IS: 5098)                                                                                                                                                                 | 01             |
| 40.0 | Spanner – adjustable, 30 cm length handle (IS: 6149)                                                                                                                                           | 01             |
| 41.0 | Door breaker                                                                                                                                                                                   | 01             |
| 42.0 | Hydraulic jack –7.5 tonnes                                                                                                                                                                     | 01             |



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

SPEC NO.: **PE-TS-412-550-A001**

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SUB-SECTION: IC, ANNEXURE II

|      |                                         |    |
|------|-----------------------------------------|----|
| 43.0 | Fire Hook (IS 927)                      | 1  |
| 44.0 | Tool kit                                | 01 |
| 45.0 | Grease gun                              | 02 |
| 46.0 | Oil feeder                              | 01 |
| 47.0 | Can oil – 2 litres                      | 01 |
| 48.0 | Oil can – 10 litres                     | 01 |
| 49.0 | Funnel for oil or fuel filling – 250 mm | 01 |



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IC, Annexure III

REV NO : 0

DATE: 10.08.2017

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IC**

**ANNEXURE: III**

**LIST OF MAINTENANCE TOOLS AND TACKLES**



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & FIRE SAFETY EQUIPMENT**

DOCUMENT NO.: PE-TS-412-550-A001

SECTION: I

REV NO.: 01

DATE: 12.01.2018

SUB-SECTION: IC, ANNEXURE III

**ANNEXURE-III**  
List of Maintenance Tools & Tackles

| Sl. No | ITEM                          | QUANTITY |
|--------|-------------------------------|----------|
| 1.     | DE spanner set 6.25 mm        | 1 set    |
| 2.     | Ring spanner set 6.25         | 1 set    |
| 3.     | Adjustable wrench 200 mm      | 1 No.    |
| 4.     | Pliers cutting                | 1 No     |
| 5.     | Pliers round nose 150 mm      | 1 No     |
| 6      | Pipe wrench 300 mm            | 1 No     |
| 7      | Screw driver 150 mm           | 1 No     |
| 8      | Screw driver 250 mm.          | 1 No     |
| 9      | File half round smooth 150 mm | 1 No     |
| 10     | Hammer ball pen ½ kg.         | 1 No     |
| 11     | Grease gun.                   | 1 No     |
| 12     | Oil feeder.                   | 1 No     |
| 13     | Carpenter saw 450/500         | 1 No     |

**Note:** The above list is bare minimum, if any other maintenance tools and tackles are required as per the vehicle requirement, same shall be provided to BHEL without any cost implication.



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: I

SUB-SECTION: IC, Annexure Iv

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: I**

**SUB-SECTION : IC**

**ANNEXURE: IV**

**QUALITY ASSURANCE PLAN**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: PE-TS-412-550-A001

SECTION: I

SUB-SECTION: IC, Annexure Iv

REV NO : 01

DATE: 12.01.2018

**QUALITY PLAN FOR MANUFACTURE OF EQUIPMENT:**

- 1.0** The Quality plan for manufacture is a document, which presents in a tabular form, the Quality Control checks to be exercised by the Contractor during the various stages of manufacture and despatch in order to meet the requirements of this Contract. This plan shall detail the components manufactured, characteristics being controlled and acceptance norms for this characteristic and the agency responsible for performance and witnessing the checks.
- 2.0** The detailed quality plans to be followed during manufacture of equipment shall be furnished by contractor during detailed engineering. These quality plans shall be approved by the Owner.
- 3.0** The details of the quality assurance / quality checks envisaged by the Contractor during manufacturing of the equipment supplied by him or procured through his sub-vendors / sub-contractors shall be detailed out in the quality plans to be submitted by the Contractor. The contractor may also furnish any additional information regarding quality assurance / quality checks in the additional sheets, if required. Quality plans for major equipments manufactured by the Contractor or procured through his sub-vendors / sub-contractors shall be submitted during engineering. The contractor shall ensure that the approved quality plans are followed scrupulously by him and by his sub-vendors / sub-contractors and manufacturing of the items covered under the quality plans shall be taken up only after Owner has approved the quality plan.
- 4.0** Reference quality plan for water tender and foam tender are attached.

|  |                                           | MANUFACTURING QUALITY PLAN                                                                             |                                                                                                                                                      |                                                                                          |                  |                                                                  |                                                                |                         |        |     |     |         |
|----------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------|----------------------------------------------------------------|-------------------------|--------|-----|-----|---------|
|                                                                                  |                                           | ITEM                                                                                                   | WATER TENDER                                                                                                                                         | BHEL QAP. NO. PE-VO-374-550-A005                                                         |                  |                                                                  |                                                                |                         |        |     |     |         |
|                                                                                  |                                           | SUB SYSTEM PO NO DTD                                                                                   | FIRE FIGHTING VEHICLE                                                                                                                                | REV NO. 2<br>DATE :<br>PAGE NO. 1                                                        |                  |                                                                  |                                                                |                         |        |     |     |         |
| SR.NO.                                                                           | COMPONENT & OPERATIONS                    | CHARACTERISTICS                                                                                        | CLASSIFICATION                                                                                                                                       | TYPE OF CHECK                                                                            | QUANTUM OF CHECK | REFERENCE DOCUMENT                                               | ACCEPTANCE NORMS                                               | FORMAT OF RECORD        | AGENCY |     |     | REMARKS |
|                                                                                  |                                           |                                                                                                        |                                                                                                                                                      |                                                                                          |                  |                                                                  |                                                                |                         | P      | W   | V   |         |
| 1.0                                                                              | MATERIAL AND COMPONENTS                   |                                                                                                        |                                                                                                                                                      |                                                                                          |                  |                                                                  |                                                                |                         |        |     |     |         |
| A                                                                                | M.S. PLATE FOR WATER TANK                 | CHEMICAL PROPERTY                                                                                      | MINOR                                                                                                                                                | CHEMICAL PROPERTY                                                                        | LOT              | IS : 2062                                                        | IS : 2062                                                      | T.C                     | —      | 2   | 1\3 |         |
| B                                                                                | G.M. (PUMP CASIING)                       | CHEMICAL PROPERTY                                                                                      | MAJOR                                                                                                                                                | CHEMICAL PROPERTY                                                                        | LOT              | IS : 318 GR.2                                                    | IS : 318 GR.2                                                  | T.C                     | —      | 2   | 1\3 |         |
| C                                                                                | S.S. FOR PUMP SHAFT                       | CHEMICAL PROPERTY                                                                                      | MAJOR                                                                                                                                                | CHEMICAL PROPERTY                                                                        | LOT              | SS 304                                                           | SS 304                                                         | T.C                     | —      | 2   | 1\3 |         |
| D                                                                                | G.M. (IMPELLER)                           | CHEMICAL PROPERTY                                                                                      | MAJOR                                                                                                                                                | CHEMICAL PROPERTY                                                                        | LOT              | IS: 318 GR. 2                                                    | IS: 318 GR. 2                                                  | T.C                     | —      | 2   | 1\3 |         |
| 1.A                                                                              | CHASSIS & ENGINE (ASHOK LEYLAND)          | MAKE , TYPE                                                                                            | MINOR                                                                                                                                                | CHASSIS DOCUMENT                                                                         | LOT              | CHASSIS DOCUMENT                                                 | CHASSIS DOCUMENT                                               | CHASSIS DOCUMENT        | —      | 2   | 1\3 |         |
| 2.0                                                                              | IN PROCESS INSPECTION                     |                                                                                                        |                                                                                                                                                      |                                                                                          |                  |                                                                  |                                                                |                         |        |     |     |         |
| A                                                                                | (STRUCTURAL) FABRICATION OF WATER TANK    | VISUAL & DIMENSION INCL. THICKNESS                                                                     | MINOR                                                                                                                                                | DIM. (VISUAL)                                                                            | 100%             | AS PER GA/WT/FT DRAWING                                          | AS PER GA/WT/FT DRAWING                                        | AS PER GA/WT/FT DRAWING | 2      | —   | 1/3 |         |
| B                                                                                | HYDRO TEST OF WATER TANK                  | HYDRO TEST                                                                                             | MAJOR                                                                                                                                                | HYDRO TEST 0.3 BAR                                                                       | 100%             | AS PER SPECIFICATION                                             | NO LEAKAGE                                                     | I.R.                    | 2      | 1/3 | —   |         |
| C                                                                                | PUMP CASING                               | HYDRO TEST                                                                                             | MAJOR                                                                                                                                                | 21KG/ CM. SQ.                                                                            | 100%             | AT 21KG/CM SQ.                                                   | NO LEAKAGE                                                     | I.R.                    | 2      | —   | 1\3 |         |
| D                                                                                | IMPELLER                                  | DYNAMIC BALANCING                                                                                      | MAJOR                                                                                                                                                | —                                                                                        | 100%             | BALANCING CERTIFICATE                                            | BALANCING CERTIFICATE                                          | T.C                     | 2      | —   | 1/3 |         |
| 3.0                                                                              | COMPLETE ASSEMBLY INSPECTION              |                                                                                                        |                                                                                                                                                      |                                                                                          |                  |                                                                  |                                                                |                         |        |     |     |         |
| A                                                                                | PUMP (PRIMER) ASSEMBLY                    | VISUAL CHECK                                                                                           | MAJOR                                                                                                                                                | COMPLETENESS / VISUAL                                                                    | 100%             | AS PER SPECIFICATION                                             | AS PER SPECIFICATION                                           | I.R.                    | 2      | —   | 1/3 |         |
| B                                                                                | HOSE REEL ASSEMBLY                        | VISUAL CHECK                                                                                           | MINOR                                                                                                                                                | -DO-                                                                                     | 100%             | AS PER SPECIFICATION                                             | AS PER SPECIFICATION                                           | I.R.                    | 2      | —   | 1/3 |         |
| 4.0                                                                              | FINAL INSPECTION OF COMPLETE WATER TENDER | PERFORMANCE TEST OF PUMP FOR 4 HOURS & DEEPLIFT TEST OF PRIMER, STABILITY TEST, ROAD TEST TILTING TEST | MAJOR                                                                                                                                                | PERFORMANCE TEST AND VERIFICATION OF LIST OF EQUIPMENT AND ACCESSORIES AS PER DATA SHEET | 100%             | APPROVED DATASHEET, APPROVED DRAWING AS PER IS: 10460 AND PO NO. | APPROVED DATASHEET, APPROVED DRAWING AS PER IS: 950 AND PO NO. | I.R.                    | 2      | 1/3 | —   |         |
| MANUFACTURER SIGNATURE                                                           |                                           |                                                                                                        | LEGEND :<br>**1. BHEL, 2 manufacturer .3 CUSTOMER<br>W: WITNESS<br>P: PERFORMAR<br>V: VERIFIER<br>I.R = INSPECTION REPORT<br>T.C. = TEST CERTIFICATE |                                                                                          |                  |                                                                  |                                                                |                         |        |     |     |         |

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|        |                                                  |                                     | MANUFACTURING QUALITY PLAN                           |                                |                                                                                      |       |                           |                           |                  |    |        |   |   |         |
|--------|--------------------------------------------------|-------------------------------------|------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------|-------|---------------------------|---------------------------|------------------|----|--------|---|---|---------|
|        |                                                  |                                     | ITEM : FOAM<br>TENDER<br>SUB-SYSTEM: FIRE<br>TENDERS |                                | QP NO.:9464-108-01FS-PVM-Q028<br>REV.NO.: 02.<br>DATE:- 29.11.2010<br>PAGE: 01OF 03. |       | MAIN-SUPPLIER:BHEL        |                           |                  |    |        |   |   |         |
| SL. NO | COMPONENT & OPERATIONS                           | CHARACTERISTICS                     | CLASS                                                | TYPE OF CHECK                  | QUANTUM OF CHECK                                                                     |       | REFERENCE DOCUMENT        | ACCEPTANCE NORMS          | FORMAT OF RECORD |    | AGENCY |   |   | REMARKS |
|        |                                                  |                                     |                                                      |                                | M                                                                                    | C / N |                           |                           |                  | D* | M      | C | N |         |
| 1.     | 2.                                               | 3.                                  | 4.                                                   | 5.                             | 6.                                                                                   |       | 7.                        | 8.                        | 9.               |    | ** 10. |   |   | 11.     |
| 1      | Chassis                                          | Make, Engine No.<br>Chassis no.     | Major                                                | Correlation                    | 100%                                                                                 |       | Vehicle Mfgr's Documents  | Vehicle Mfgr's Documents  |                  |    | P      | V | V |         |
| 2      | <u>Raw Material</u>                              |                                     |                                                      |                                |                                                                                      |       |                           |                           |                  |    |        |   |   |         |
| a)     | MS plate for water tank.                         | Chemical & Mech property            | Major                                                | Chemical & Mech property       | 1/Lot                                                                                |       | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 | T.C.             | ✓  | P      | V | V |         |
| b)     | SS plate for foam tank.                          | Chemical & Mech property            | Major                                                | Chemical & Mech property       | 1/Lot                                                                                |       | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 | T.C.             | ✓  | P      | V | V |         |
| c)     | Raw material for pump casing, impeller and shaft | Chemical & Mechanical               |                                                      | Chemical & mechanical property | 1/heat<br>1/batch for shaft                                                          |       | -----Approved drg/DS----- |                           | T.C              | ✓  | P V V  |   |   |         |
| 3      | <u>Inprocess Inspection</u>                      |                                     |                                                      |                                |                                                                                      |       |                           |                           |                  |    |        |   |   |         |
| a      | Fabrication of water and foam tank.              | Visual & Dimension incl. Thickness. | Minor                                                | Dimensional (visual)           | 100%                                                                                 |       | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 | IR               | ✓  | P      | V | V |         |
| b      | Leak test of water and foam tank.                | Leak test.                          | Major                                                | Leak test (0.3 bar)            | 100%                                                                                 |       | Approved drg./DS/IS 10460 | No Leakage                | IR               | ✓  | P      | V | V |         |
| c      | Pump casing.                                     | Hydro test.                         | Major                                                | 21 kg/cm.Sq                    | 100%                                                                                 |       | at 21 kg/cm2 for 30 min   | No leakage.               | IR               | ✓  | P      | V | V |         |
| d      | Impeller                                         | Dynamic balancing                   | Major                                                |                                | 100%                                                                                 |       | ISO 1940 gr 6.3           | ISO 1940 gr 6.3           | balancing report | ✓  | P      | V | V |         |
| e      | Ultrasonic test on shaft for dia > 50 mm         | sub-surface defects                 |                                                      | UT                             | 100%                                                                                 |       | ASTM A 388                | as per note 1             | UT report        | ✓  | P      | V | V |         |

|                               |               |                                                                                                                                                                                                                                                                                              |                    |                             |             |               |
|-------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|-------------|---------------|
|                               |               | <b>LEGEND:</b> * RECORDS, IDENTIFIED WITH “TICK” (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.<br>** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC<br>P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUM “N” AS ‘ W” |                    | DOC. NO.: REV..... CAT..... |             |               |
| MANUFACTURER/<br>SUB-SUPPLIER | MAIN-SUPPLIER |                                                                                                                                                                                                                                                                                              | FOR<br>NTPC<br>USE |                             |             |               |
| SIGNATURE                     |               |                                                                                                                                                                                                                                                                                              |                    | REVIEWED BY                 | APPROVED BY | APPROVAL SEAL |

FORMAT NO.: QS-01-QAI-P-09/F1-R1

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ENGG. DIV./QA&I

Note 1: when Back Wall Echo (BWE) set to 100% Full Screen Height (FSH) , a defect echo > 20% FSH is not acceptable. Also loss of BWE > 20% is not acceptable.

# MANUFACTURING QUALITY PLAN

ITEM : FOAM  
TENDER  
SUB-SYSTEM: FIRE  
TENDERS

QP NO.:9464-108-01FS-PVM-Q028  
REV.NO.: 02.  
DATE:- 29.11.2010  
PAGE: 01 OF 03.

MAIN-SUPPLIER:BHEL

4

Final Inspection of  
Complete Fire Truck.

1. Leakage Test of  
Pipe Line &  
Valves.

Major

Visual

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

IR

✓

P

V

V

2. Road test &  
Braking Test.

Major

Visual

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

3. Pump Running  
Test &  
Performance.

Major

4 hour run test  
as per IS 10460  
Operational

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

4. Priming  
Performance Test.

Major

Operational  
as per IS 10460

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

5. Control panel  
operational check.

Major

Operational

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

6. Monitor  
Performance Test.

Major

Functional.

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

7. Water Hose Reel  
Testing.

Major

Functional.

100%

Approved  
drg./DS/IS 10460

Approved  
drg./DS/IS 10460

✓

P

W

W

**LEGEND:** \* RECORDS, IDENTIFIED WITH "2ICK" (✓) SHALL BE  
ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.  
\*\* M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC  
P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE,  
CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'

DOC. NO.:

REV..... CAT.....

MANUFACTURER/  
SUB-SUPPLIER

MAIN-SUPPLIER

FOR  
NTPC  
USE

REVIEWED BY

APPROVED BY

APPROVAL SEAL

FORMAT NO.: QS-01-QAI-P-09/F1-R1

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ENGG. DIV./QA&I



Digitally signed by Srikrishna  
DN: cn=Srikrishna, c=IN, o=Ntpc,  
ou=ITW Eng,  
email=drsrikrishna@ntpceoc.co.in  
Date: 2010.12.13 16:11:37 +05'30'

Page 107

| MANUFACTURER'S NAME AND ADDRESS |  |                                                 | MANUFACTURING QUALITY PLAN                     |                                      |                                                                                      |  | MAIN-SUPPLIER:BHEL        |                           |  |                                                                                     |   |   |   |  |
|---------------------------------|--|-------------------------------------------------|------------------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------|--|---------------------------|---------------------------|--|-------------------------------------------------------------------------------------|---|---|---|--|
|                                 |  |                                                 | ITEM : FOAM TENDER<br>SUB-SYSTEM: FIRE TENDERS |                                      | QP NO.:9464-108-01FS-PVM-Q028<br>REV.NO.: 02.<br>DATE:- 29.11.2010<br>PAGE: 01OF 03. |  |                           |                           |  |                                                                                     |   |   |   |  |
| Page 95 of 107                  |  | 8. Electrical Function Test.                    | Major                                          | Functional                           | 100%                                                                                 |  | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 |  |  | P | W | W |  |
|                                 |  | 9. Determination of Actual pay load.            | Major                                          | Visual                               | 100%                                                                                 |  | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 |  |  | P | W | W |  |
|                                 |  | 10. Static Stability test.                      | Major                                          | Visual                               | 100%                                                                                 |  | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 |  |  | P | W | W |  |
|                                 |  | 11. Completeness of Equipment.                  | Major                                          | Verification of various accessories. | 100%                                                                                 |  | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 |  |  | P | W | W |  |
|                                 |  | 12. Painting Quality (both internal & external) | Major                                          | DFT, Paint Shade.                    | 100%                                                                                 |  | Approved drg./DS/IS 10460 | Approved drg./DS/IS 10460 |  |  | P | V | V |  |

Notes:

- 1) Manufacturer TC for Foam Monitor, Foam Compound Proportioner, Foam Branch pipe and Hose shall be produced for Verification during final inspection.

/coupling/ nozzle

|                               |               |                                                                                                                                                                                                                                                                                             |                    |                             |             |               |
|-------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|-------------|---------------|
|                               |               | <b>LEGEND:</b> * RECORDS, IDENTIFIED WITH “TICK” (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.<br>** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC<br>P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUM “N” AS ‘W” |                    | DOC. NO.: REV..... CAT..... |             |               |
| MANUFACTURER/<br>SUB-SUPPLIER | MAIN-SUPPLIER |                                                                                                                                                                                                                                                                                             | FOR<br>NTPC<br>USE |                             |             |               |
| SIGNATURE                     |               |                                                                                                                                                                                                                                                                                             |                    | REVIEWED BY                 | APPROVED BY | APPROVAL SEAL |

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**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: II

Annexure V

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: II**

**ANNEXURE: V**

**MASTER DRAWING LIST WITH SCHEDULE OF  
SUBMISSION**

| <b>ANNEXURE-V</b>                                       |                    |                                          |                 |                                                                                                               |                                                  |
|---------------------------------------------------------|--------------------|------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>MDL FOR FIRE TENDERS &amp; FIRE SAFETY EQUIPMENT</b> |                    |                                          |                 |                                                                                                               |                                                  |
| <b>2 X 660MW ENNORE SEZ STPP</b>                        |                    |                                          |                 |                                                                                                               |                                                  |
| <b>S.N</b>                                              | <b>DRWG NO</b>     | <b>DRWG TITLE</b>                        | <b>CATEGORY</b> | <b>SCHEDULED SUBMISSION (NO. OF WEEKS FROM LOA DATE / PO DATE) or AS SPECIFIED IN NIT, WHICHEVER EARLIER.</b> | <b>RESUBMISSION AFTER COMMENTS INCORPORATION</b> |
| 1                                                       | PE-V0-412-550-A001 | T.D.S & GA OF WATER TENDER               | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 2                                                       | PE-V0-412-550-A002 | TDS & G.A OF FOAM TENDER                 | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 3                                                       | PE-V0-412-550-A003 | T.D.S & GA OF FIRE JEEP                  | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 4                                                       | PE-V0-412-550-A004 | T.D.S & GA OF AMBULANCE                  | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 5                                                       | PE-V0-412-550-A005 | T.D.S & GA OF FIRE SAFETY EQUIPMENTS     | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 6                                                       | PE-V0-412-550-A006 | MQP FOR WATER TENDER                     | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 7                                                       | PE-V0-412-550-A007 | MQP FOR FOAM TENDER                      | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 8                                                       | PE-V0-412-550-A008 | MQP FOR FIRE JEEP                        | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 9                                                       | PE-V0-412-550-A009 | MQP FOR AMBULANCE                        | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 10                                                      | PE-V0-412-550-A010 | Sub Vendor List with Inspection Category | A-CUST          | 4                                                                                                             | WITHIN 1 WEEK                                    |
| 11                                                      | PE-V0-412-550-A011 | O & M MANUAL                             | A-CUST          | 8                                                                                                             | WITHIN 1 WEEK                                    |

Note:

Drawing / Document shall be uploaded by the successful bidder on WRENCH /DMS. Procedure for the same will be informed after award of contract.



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENTS**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: II**

**ANNEXURE: VI**

**REV 01**

**DATE: 12.01.2018**

**ANNEXURE-VI**

**FORMAT FOR OPERATION AND MAINTENANCE  
MANUAL**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENTS**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: II**

**ANNEXURE: VI**

**REV 01**

**DATE: 12.01.2018**

Project name :  
Project number :  
Package Name :  
PO reference :  
Document number :  
Revision number :

| Sl.no. & Sections | Description                                                                                                                                                                                                     | Tick ( V )if included in Manual |    |                | Remarks |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----|----------------|---------|
|                   |                                                                                                                                                                                                                 | Yes                             | No | Not Applicable |         |
| <b>1.</b>         | <b>COVER PAGE</b>                                                                                                                                                                                               |                                 |    |                |         |
| <b>1.1</b>        | Project Name                                                                                                                                                                                                    |                                 |    |                |         |
| <b>1.2</b>        | Customer/consultant Name                                                                                                                                                                                        |                                 |    |                |         |
| <b>1.3</b>        | Name of Package                                                                                                                                                                                                 |                                 |    |                |         |
| <b>1.4</b>        | Supplier details with phone, FAX ,email address , Emergency Contact number                                                                                                                                      |                                 |    |                |         |
| <b>1.5</b>        | Name and sign of prepared by , checked by & approved by                                                                                                                                                         |                                 |    |                |         |
| <b>1.6</b>        | Revision history with approval Details                                                                                                                                                                          |                                 |    |                |         |
| <b>2.0</b>        | <b>INDEX</b>                                                                                                                                                                                                    |                                 |    |                |         |
| <b>2.1</b>        | showing the sections & related page nos<br>All the pages should be numbered section wise                                                                                                                        |                                 |    |                |         |
| <b>3.0</b>        | <b>DESCRIPTION OF PLANT/SYSTEM</b>                                                                                                                                                                              |                                 |    |                |         |
| <b>3.1</b>        | Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases |                                 |    |                |         |
| <b>3.2</b>        | Equipment list and basic parameter with Tag numbers                                                                                                                                                             |                                 |    |                |         |
| <b>3.3</b>        | Data sheets approved by Customer/for information and catalogues provided by original manufacturer                                                                                                               |                                 |    |                |         |
| <b>3.4</b>        | Associated other packages and Interface /terminal points                                                                                                                                                        |                                 |    |                |         |
| <b>3.5</b>        | P&ID & Process Diagrams                                                                                                                                                                                         |                                 |    |                |         |
| <b>3.6</b>        | GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)                                                                        |                                 |    |                |         |
| <b>3.7</b>        | Single line/wiring diagrams                                                                                                                                                                                     |                                 |    |                |         |
| <b>3.8</b>        | Control philosophy /control write-ups                                                                                                                                                                           |                                 |    |                |         |



## 2X660 MW ENNORE SEZ STPP FIRE TENDERS & FIRE SAFETY EQUIPMENTS

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: II**

**ANNEXURE: VI**

**REV 01**

**DATE: 12.01.2018**

| Sl.no. & Sections | Description                                                                                                                                                                                                                     | Tick ( ✓ )if included in Manual |    |                | Remarks |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----|----------------|---------|
|                   |                                                                                                                                                                                                                                 | Yes                             | No | Not Applicable |         |
| <b>4.0</b>        | <b>COMMISSIONING ACTIVITIES (IF NOT COVERED IN SEPARATE DOCUMENT I.E. ERECTION MANUAL, COMMISSIONING MANUAL)</b>                                                                                                                |                                 |    |                |         |
| <b>4.1</b>        | Pre-Commissioning Checks                                                                                                                                                                                                        |                                 |    |                |         |
| <b>4.2</b>        | handling of items at site                                                                                                                                                                                                       |                                 |    |                |         |
| <b>4.3</b>        | Storage at site                                                                                                                                                                                                                 |                                 |    |                |         |
| <b>4.4</b>        | Unpacking & Installation procedure                                                                                                                                                                                              |                                 |    |                |         |
| <b>5.0</b>        | <b>OPERATION GUIDELINES FOR PLANT PERSONAL/USER/OPERATOR</b>                                                                                                                                                                    |                                 |    |                |         |
| <b>5.1</b>        | Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.                                                |                                 |    |                |         |
| <b>5.2</b>        | Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned. |                                 |    |                |         |
| <b>5.3</b>        | Do's & Don't of the equipments.                                                                                                                                                                                                 |                                 |    |                |         |
| <b>5.4</b>        | Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition                                                         |                                 |    |                |         |
| <b>5.5</b>        | Parameters to be monitored with normal values and limiting values                                                                                                                                                               |                                 |    |                |         |
| <b>5.6</b>        | Trouble shooting with causes and remedial measures                                                                                                                                                                              |                                 |    |                |         |
| <b>5.7</b>        | Routine operational checks, recommended logs & records                                                                                                                                                                          |                                 |    |                |         |
| <b>5.8</b>        | Changeover schedule if more than one auxiliary for the same purpose is given                                                                                                                                                    |                                 |    |                |         |
| <b>5.9</b>        | Painting requirement and schedule                                                                                                                                                                                               |                                 |    |                |         |
| <b>5.10</b>       | Inspection, repair , Testing and calibration procedures                                                                                                                                                                         |                                 |    |                |         |
| <b>6.0</b>        | <b>MAINTENANCE GUIDELINES FOR PLANT PERSONAL</b>                                                                                                                                                                                |                                 |    |                |         |



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENTS**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: II**

**ANNEXURE: VI**

**REV 01**

**DATE: 12.01.2018**

| Sl.no. & Sections | Description                                                                                                                                                                                                                     | Tick ( ✓ )if included in Manual |    |                | Remarks |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----|----------------|---------|
|                   |                                                                                                                                                                                                                                 | Yes                             | No | Not Applicable |         |
| <b>6.1</b>        | List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.                                                                                      |                                 |    |                |         |
| <b>6.2</b>        | Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given. |                                 |    |                |         |
| <b>6.3</b>        | Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given                                                                                                          |                                 |    |                |         |
| <b>6.4</b>        | Long term maintenance schedules especially for structural, foundations etc.                                                                                                                                                     |                                 |    |                |         |
| <b>6.5</b>        | Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.        |                                 |    |                |         |
| <b>6.6</b>        | List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given                                                                             |                                 |    |                |         |
| <b>6.7</b>        | List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.                                                                                              |                                 |    |                |         |
| <b>6.8</b>        | List of mandatory and recommended spare parts list                                                                                                                                                                              |                                 |    |                |         |
| <b>6.9</b>        | Tentative Lead time required for ordering of spares from the equipment supplier                                                                                                                                                 |                                 |    |                |         |
| <b>6.10</b>       | Guarantee and warranty clauses                                                                                                                                                                                                  |                                 |    |                |         |
| <b>7.0</b>        | <b>Statutory and other specific requirements considerations.</b>                                                                                                                                                                |                                 |    |                |         |
| <b>8.0</b>        | <b>List of reference documents</b>                                                                                                                                                                                              |                                 |    |                |         |
| <b>9.0</b>        | <b>Binding as per requirement</b>                                                                                                                                                                                               |                                 |    |                |         |



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: III

REV NO : 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: III**

**DOCUMENTS TO BE SUBMITTED BY BIDDER**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: III

SUB-SECTION: IIIA

REV NO: 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: III  
SUB-SECTION: III A**

**LIST OF DOCUMENTS TO BE SUBMITTED  
WITH BID**

|                                                                                   |                                                                                 |                                      |                  |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------|------------------|
|  | <b>2X660 MW ENNORE SEZ STPP<br/>FIRE TENDERS &amp; FIRESAFETY<br/>EQUIPMENT</b> | SPECIFICATION No: PE-TS-412-550-A001 |                  |
|                                                                                   |                                                                                 | SECTION : III                        |                  |
|                                                                                   |                                                                                 | SUB-SECTION : III A                  |                  |
|                                                                                   |                                                                                 | REV: 01                              | DATE: 12.01.2018 |
|                                                                                   |                                                                                 |                                      |                  |

**BIDDER SHOULD SUBMIT THE SIGNED AND STAMPED COPY OF THE FOLLOWING DOCUMENTS ALONG WITH TECHNICAL BID:**

1. Compliance cum confirmation certificate (Section-III B)
2. Pre bid clarification schedule (Section-III C)
3. No deviation certificate(Section-III D)
4. Un-priced price bid indicating “Quoted / Not quoted / Not applicable” as the case may be.
5. List of Recommended Spares (Section-6 of Vol-III)
6. Equipments to be supplied with Foam tender (Annexure-I)
7. Equipments to be supplied with Water Tender (Annexure-II)
8. List of Maintenance Tool & Tackles (Annexure-III)

Please note that all the schedules shall be submitted even though they may not be applicable. Under such circumstances it shall be clearly mentioned across such schedules that these are not applicable. (E.g. in case of there are no technical deviation, it shall be mentioned in the deviation schedule that ‘THERE ARE NO DEVIATIONES TO THE TECHNICAL SPECIFICATION’).

Name:  
Signature:  
Designation:  
Company:  
Date:

Bidder Stamp



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: III

SUB-SECTION: III B

REV NO: 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: III**  
**SUB-SECTION: III B**

**COMPLIANCE CUM CONFIRMATION**  
**CERTIFICATE**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENT**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: III**

**SUB-SECTION: III B**

**REV. NO. 01**

**DATE:12.01.2018**

**COMPLIANCE CUM CONFIRMATION CERTIFICATE**

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENT**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: III**

**SUB-SECTION: III B**

**REV. NO. 01**

**DATE:12.01.2018**

commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account

- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.
- m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: III

SUB-SECTION: III C

REV NO: 0

DATE: 10.08.2017

**VOLUME - II B**

**SECTION: III**  
**SUB-SECTION: III C**

**PRE BID CLARIFICATION SCHEDULE**



**2X660 MW ENNORE SEZ STPP  
FIRE TENDERS & FIRE SAFETY  
EQUIPMENTS**

**SPECIFICATION No: PE-TS-412-550-A001**

**SECTION: III**

**SUB-SECTION: III C**

**REV. NO. 01**

**DATE: 12.01.18**

**PRE-BID CLARIFICATION SCHEDULE**

| S. NO. | SECTION/CLAUSE/PAGE NO. | STATEMENT OF THE REFERRED CLAUSE | CLARIFICATION REQUIRED |
|--------|-------------------------|----------------------------------|------------------------|
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The bidder hereby clarifies that above mentioned are the only clarifications required on the technical specification for the subject package.

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Company: \_\_\_\_\_

Date: \_\_\_\_\_

Company Seal



**2X660 MW ENNORE SEZ STPP**  
**FIRE TENDER & SAFETY EQUIPMENT**

SPEC. NO.: **PE-TS-412-550-A001**

SECTION: III

SUB-SECTION: III D

REV NO: 01

DATE: 12.01.2018

**VOLUME - II B**

**SECTION: III**  
**SUB-SECTION: III D**

**DEVIATION SCHEDULE**

**DEVIATION SHEET (COST OF WITHDRAWAL)****PROJECT:- 2 x 660MW ENNORE SEZ STPP****PACKAGE:- FIRE TENDERS & FIRE SAFETY EQUIPMENT****TENDER ENQUIRY REFERENCE:-****NAME OF VENDOR:-**

| SL NO | VOULME/ SECTION | PAGE NO. | CLAUSE NO. | TECHNICAL SPECIFICATION/ TENDER DOCUMENT | COMPLETE DESCRIPTION OF DEVIATION | COST OF WITHDRAWAL OF DEVIATION | REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE | NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE) | REASON FOR QUOTING DEVIATION |
|-------|-----------------|----------|------------|------------------------------------------|-----------------------------------|---------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------|
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**TECHNICAL DEVIATIONS**

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**COMMERCIAL DEVIATIONS**

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**PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE**

| NAME | DESIGNATIONS | SIGN & DATE |
|------|--------------|-------------|
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**NOTES:**

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.