SPECIFICATION OF FIRE JEEP ENGINE AS PER IS 2696-1974(REAFFIRMED 2002) EDITI0N.2.2 (1977-04) WITH EQUIPMENTS

1. The fire jeep engine to be strictly fabricated as per IS: 2696-1974(Reaffirmed 2002) Edition.2.2 (1977-04) preferably on the chassis of TATA turbo 207 model or equivalent model complying with BS IV or latest emission standards at the time of delivery.

2. GENERAL REQUIREMENTS

2.1 The appliance shall consist of a very light transport vehicle capable of traversing rough and hilly terrains as would be encountered in rural and hilly areas and shall be capable of being easily maneuvered in the very narrow streets of towns and congested areas of cities. It shall have a rear-mounted pump enabling firefighting as well as dewatering jobs.

2.2 The appliance when fully laden (but without trailer) shall be able to attain a maximum road speed of 65 km/h on a level road. The acceleration shall be such that with a warm running engine, the fully laden appliance shall attain a speed of 55 km/h from a standing start through gears in a maximum time of 40 seconds. The appliance shall also be capable of being started from rest up a gradient of 1 in 4 when fully laden. When a trailer is attached with the appliance the speed of the appliance should not exceed 30 km/h.

2.3 Brakes shall be on hydraulic system (preferably of vacuum or air-assisted type). These shall be capable of stopping the vehicle when travelling at 45 km/h (fully-laden and manned on dry road) within a distance of 6 m from the point at which the brake is applied. The hand brake system shall be capable of holding the fully-laden appliance stationary on a dry surface gradient 1 in 4 when in neutral gear.

2.4 The design and construction of all parts shall be such that it is possible to supply replaceable parts and that they will fit in correctly.

3. MATERIAL SELECTION AND TREATMENT

3.1 The choice of material to be used in the construction of the appliance shall be made with a view to combining lightness with strength and durability.

3.2 All parts which form waterways or come in contact with water shall be of corrosion-resisting material. All metal parts exposed to atmosphere shall wither be corrosion-resistant or shall be treated suitably.

4. DESIGN AND CONSTRUCTION

4.1 **Water tank** : The tank of 700 liters capacity constructed with SS plate. The tank body and baffles shall be minimum of 3 mm thickness expect bottom, which shall be 05 mm thickness, treated for anticorrosion shall be suitably mounted on the chassis in a manner keeping in view of the proper load distribution of the axles, all parts prone to

corrosion shall be painted with two coat “Epoxy” primer and two coats of “Epoxy” paint.

NOTE: As per the IS No 2696-1974(Reaffirmed 2002) Editin.2.2 (1977-04) for fire jeep engine is not having provision of water tank. But the models like Chassis of TATA turbo 207 or equivalent models can be fitted with 700 ltrs water tank for Fire jeep engine to douse the fire with water at the inception stage of a fire at congested & narrow place.

4.2 Chassis

4.2.1 The chassis shall be designed for carrying a load which exceeds the estimated maximum load (including loose equipment detailed in Appendix A and two men). The total weight of the appliance, when fully-laden, shall not exceed the rated gross vehicle weight (GVW) of the vehicle. It shall be taken into account that the appliance stands laden throughout most of its life. The wheel base shall be between 2.5 m and 3.2 m and the overall width shall not exceed 1.9 m. The turning circle shall be as small as possible, but not more than 12.5 m. The ground clearance shall be not less than 20 cm.

4.2.2 The chassis shall be four-wheeler with load distributed over all the four wheels. The tyre size and treads shall be such as to ensure easy floatation and traction on soft soil and rough and hilly terrain. The appliance shall be capable of good cross-country performance. Drag hooks or eyes of adequate strength shall be fitted to all chassis members at front and rear. The lubricating nipples shall be located at accessible and protected positions. Where nipples are fitted on or adjacent to their bearings and are connected to them by pipes, plates on the nipples shall be provided to indicate the points which they serve. The springs shall be of high grade steel, preferably of elliptical type and shall incorporate anti-roll leaves, if possible. Shock absorbers shall be fitted to all the wheels. Provision shall be made at the rear for a towing hitch suitable for a two-wheeled trailer. The driving position shall preferably be forward or semi-forward.

4.2.3 Gear-box shall have at least four speeds. **Provision shall be made for working the pump direct from the transmission**. Means shall be provided to determine reasonably accurately the oil level in the gear-box, preferably by a dip-stick, if possible.

4.3 Engine

4.3.1 The Engine shall be diesel driven, water cooled, direct injection and shall be capable of developing a maximum output of 72 Hp at 3000 RPM and a maximum torque of 223 Nm at 2000 RPM. Means shall be provided to ensure reliable and quick starting up of the engine with an electrically-operated starter of adequate power.

4.3.2 The engine shall be capable of driving the fully-laden appliance at speed from starting-up without any preliminary running period, even under cold atmospheric conditions. The operating temperature of the engine-cooling water shall preferably be thermostatically-controlled.

4.3.3 Heat exchanger of indirect cooling system shall be provided to permit prolonged running of the pump without overheating. This shall be of open-circuit type to permit discharge of water to waste. Control valve shall be provided to regulate water supply in the indirect cooling system. Heat exchanger shall be so selected that operating temperature does not exceed the value specified under 7.1(c).

4.3.4 PTO (power take off) Full torque, drive line PTO unit capable of transmitting full power of the engine to the pump will be provided. Lever of PTO will be provided in the driver's cabin. The make of the PTO shall be of VAS or SYALL make. Necessary support for PTO units, propeller shaft coupling etc. shall be provided. The drive assembly component shall be dynamically balanced.

4.3.5 Suitable temperature indicating gauge for water, and oil pressure indicating gauge for lubricating system appropriately marked with their normal operating ratings shall be provided on the instrument panel in the driver's enclosure. The engine lubricating system shall be provided with an accessible external filter. Means shall be provided to gauge reasonably accurately, with the engine stopped, the level of the oil in the sump, preferably a tubed dip-stick.

4.3.5 Clutch shall be of heavy-duty type.

4.4 Fuel System

4.4.1 The fuel tank shall have a capacity of not less than 60 liters. A fuel tank content gauge shall be fitted on the instrument panel in the driver's enclosure.

4.4.2 The filling orifice shall be ample size (not less than 50 mm) and shall be in an accessible position. The cap shall be clearly marked to show that it is for fuel, and an anti-flash device shall be incorporated in it.

4.5 Pump

4.5.1 The pump shall be rear mounted, centrifugal type and so designed as to the impeller. It shall preferably be of single stage design and shall be as light as possible. The pump shaft shall be made of stainless steel and shall be carried in anti-friction bearings within the casing in the case of front-mounted pump. The impeller neck ring and the impeller rings shall be renewable and manufactured from high quality bronze. The glands shall preferably be of self-adjusting type. A drain plug shall be provided at the bottom of the casing.

4.5.2 The pump shall be tested for its performance duties (see 4.5.3) at 16.5 C and at atmospheric pressure of 760 mm of mercury. The following allowances shall be made:

a) One percent for every 2.5 C temperature-rise;

b) Four percent for every 300 m elevation above mean sea level; and

c) No allowance shall be made for humidity up to 75 percent. However suitable deduction shall be made when the humidity ranges from 75 to 95 percent.

NOTE – Suction lift is reduced by 30 cm for every 300 m elevation above mean sea level. The temperature of water also affects the lift and output, and necessary variation may be allowed.

4.5.3 The pump, when tested (see 4.5.2), shall be of fulfilling the duties given in Table 1.

TABLE 1 DUTIES OF THE PUMP

SL No	OUTPUT NOT LESS TAHN (LPM)	DISCHARGE PRESSURE (Kg/cm^2)	LIFT MEASURED VERTICALLY FROM WATER LEVEL TO SECTION EYE (m)	CONDITION
1.	1125	7.0	3	Working through 5 m, i.e. two 2.5-m lengths of specified suction hose
2.	1100	8.5	3	Working through 10 m, i.e. two 2.5-m lengths of specified suction hose

4.5.4 Suction inlet shall be provided with a standard 75-mm suction hose connection with removable internal strainer and blank cap. The strainer, although readily removable, shall be retained firmly in position when in use. There shall be two delivery valves having 63 mm quick release couplings with quick closing valves and standard hose connections. Blank caps shall be provided and there shall be arrangements for relieving pressure between the valve and the cap.

4.5.5 The pump shall be mounted at the rear of the appliance.

4.6 Primer --- The primer shall be capable of lifting water at least through 7.0 m at a rate of not less than 30 cm/s and shall preferably be fully automatic thus eliminating the need for any action on the part of the pump operator. If the primer shall be of reciprocating piston type and is subject to speed limitation; then means shall be provided to limit automatically the speed of the engine while the primer is engaged.

4.7 Control Panel

4.7.1 Adequately illuminated control panel shall be provided and positioned according to the position of the pump and shall include the following items:

a) Throttle control for the engine;

b) Pressure gauge calibrated from 0 to 16 kgf/cm2;

c) Compound gauge calibrated as follows:

Vacuum --- 0 to 750 mm of mercury in red, and

Pressure --- 0 to 5 kgf/cm2 in black;

d) Primer control, if the primer is not fully automatic; and

e) Revolution indicator, if available.

4.7.2 The pipes connecting the gauges shall be designed for self-drainage. Each gauge pipe shall be fitted with a cock.

4.7.3 The control panel shall be adjacent to the suction and delivery connections.

4.8. Bodywork and Stowage

4.8.1 The body shall provide seating accommodation for two men including driver in the front and standing accommodation at the rear on the footboard with grab rails for two men. The body work shall be of open type. The driver's seat shall be adjustable. Provision shall be made for carrying a 4.5-m extension ladder on the appliance.

4.8.2 Lockers or other suitable accommodation shall be provided for all the equipment detailed in Appendix A. A spare wheel with tyre and tube shall be supplied with the appliance but no provision for mounting the wheel on the vehicle is required. However, a carrier for carriage of the spare wheel during road transportation shall be provided.

4.8.3 All lockers shall have internal lighting, preferably automatically switched 'on' and 'off' by the opening and closing of the doors or lids. A master switch for insolation of the locker-lighting circuit shall be fitted in the driving compartment.

4.8.4 Provision for wireless equipment to suit requirements shall be made, the control panel of the wireless equipment shall be located in the driver's enclosure. A long arm outside fitting type rear view mirror may also be provided.

4.8.5 Grab rails and non-skid steps to assist the crew to mount and dismount shall be provided at the back of the vehicle where required.

4.8.6 No part of the bodywork shall reduce the road clearance to less than 20 cm, when the appliance is fully loaded nor increase the width of the appliance to more than 2.0 m and height of the appliance along with ladder mounted shall not exceed 2.6m from ground level.

4.8.7 All seats shall be filled with sponge rubber and covered with PVCL coated leather cloth.

4.8.8 Compartments and lockers provided for the stowage of equipment shall be fitted with readily accessible quick release brackets and hanging racks. Racks shall be preferably painted as shadow boards for ready identifications of each equipment. All lockers shall be dustproof with hinged doors and recessed handles.

4.8.9 Doors of lockers shall have efficient means of holding them open and efficient flush-fitting spring-loaded locks. Doors of side lockers with the exception of low lockers shall not be hinged at the bottom. Doors of low lockers hinged at the bottom shall have not less than 5 cm ground clearance when open with the appliance fully laden.

4.8.10 Hose lockers of waterproof type shall have smooth floors. The height from the bottom to the top shall not be less than 550 mm and the depth of locker shall also be not less than 550 mm.

4.8.11 If doors are hinged and open outwards, they shall be hung forward and shall have locks with double striking plates. The doors or door locks shall be so designed as to prevent their being inadvertently opened from inside.

4.9 Ladder Gallows – The design of the gallows shall be such that it is possible to release the ladder without difficulty from a reasonably accessible position and shall embody rollers to permit easy withdrawal by one man. Means shall be provided for locking the ladder on the gallows. No equipment shall be so positioned so as to interfere with the easy and independent removal of the ladder.

4.10 Tool-Kit Container – A specially fitted recessed tray, below the driver's seat, for the normal kit of tools carried on the appliance shall be provided, if required.

4.11 Stability – The stability of the appliance shall be such that under fully-equipped and loaded conditions but excluding crew, if the surface on which the appliance stands is titled to either side, the point at which overturning occurs is not passed at an angle of 27 ½ from the horizontal.

4.12. Provision with handrails shall be made for placing the portable fire extinguisher.

5. WORKMANSHIP AND FINISH

5.1 The standard of workmanship and finish of all parts shall be such that he parts normally required to be replaced can be supplied and fitted correctly.

5.2 The appliance shall be painted after proper cleaning and giving protective coat fire red on the outside with fire service insignia painted according to the purchaser's requirement. The appliance shall be painted suitably in the inside also.

6. INSTRUCTION BOOK, ACCESSORIES AND EQUIPMENT

6.1 Instruction Book – Three instruction books for the guidance of the user, including both operating and normal maintenance procedure, shall supplied. The books shall include an itemized and illustrated spare parts list giving reference numbers of all the wearing parts with a view to ensuring that adequate number of such spare parts is made easily available when necessary.

6.2 Accessories --
The following accessories shall also be provided in addition to those normally fitted a standard on modern commercial vehicles:

a) Fire Bell – one 250=-mm F-natural tone carillon fire bell (see IS : 928-964*),shall be mounted externally and for operation from within the driver's enclosure.

b) Fog Lamps – low mounted and of appropriate design.

c) Reversing Light --- a lamp suitably situated to assist reversing along with warning hooter/sound.

d) Trafficators : with light on instrument panel or in any other prominent position in the driver's enclosures.

e) Wind screen wipers-(electrically-operated) two of approved design.

f) Tools: all tolls required for normal routine maintenance of the appliance which are not included in the standard kit of tools for chassis. These shall include 5 tones hydraulic jack.

g) Connection for Tail Light of Trailer: an efficient twin wire socket and plug for connecting the cable for the tail light of the trailer.

h) Search Light: adjustable to give flood or beam light, mounted in a convenient position.

i) Spot Light, Adjustable mounted in a convenient position on the rear side of the driver's enclosure.

j) Inspection Lamp: protected type on wander lead with plug. A socket shall be provided on the control panel in the driver's enclosure for plugging in the lamp

k) Removable spark arrester fitted to the exhaust pipe of the engine : 01 No.

l) Charging point for GPS system / mobile system shall be provided in the cabin.

m) Wireless set Model: Motorola GM 338 or any other equivalent make /model complete with microphone, antenna and other accessories to be fitted in fire tender. Frequency :- 29.7 36 M Hz, 36-42 MHz, 42-50 MHz, 136-174 MHz, 403-470 MHz, 450-527 MHz(1- 25 W) Channels :-128

n) Public Address System: Latest type GRAND/AHUJA make light bar with two tone hooter/mike system with amplifiers & microphone shall be provided in front of Officer Seat in driver's cabin in a box. The model will incorporate 4 Nos. of halogen lights and 4 nos. of strobe lights. The model will be VENUSVOICE and will be of a minimum capacity of 75 watts and wire guard also shall be provided to safe the Grand make light bar.

6.3 Equipment: The appliance shall be provided with all or any selected items for the equipment detailed in Appendix 'A as required.

7. ACCEPTANCE TESTS:

7.1 The appliance shall be subjected to the following tests. These tests may be made at the manufacture's work, fire brigade, or elsewhere, as required.

a) Road Tests

1) Acceleration and performance tests shall be made to check fulfillment of the requirement laid down in 2.2.

2) Braking test shall be made to check fulfillment of the requirement laid down in 2.3.

3) Turning circle test shall be made to check fulfillment of the requirements laid down in 4.2.1.

Note: For the purpose of road tests (1) and (2), the ladder shall be in position, and fuel tank shall be full, and all the scheduled equipment carried in designed stowage position, unless it is mutually agreed that a test load may be carried in lieu of the equipment.

b) Stability Test; Stability test shall be made to check fulfillment of the requirements laid down in 4.11

c) Pump test: In addition to tests to check that the pump fulfills the requirements laid down in 4.5.3, the pump shall be run for a continuous period of four hours delivering not less than the output specified in 4.5.3, at 3.0 m lift and at the atmospheric pressers give in 4.5.2. During the test, the temperature of engine

cooling water and the lubricating oil shall not exceed 85 c and 79.5 C respectively.

d) Primer Test: The primer shall be tested with a vertical lift of 7.0 m measured from the water level to the center of the suction eye of the pump in order to check fulfillment of the requirements laid down in 4.6

8. MANUFACTURES' CERTIFICATE AND GUARANTEE

8.1 The manufacturer shall provide a certificate to the effect that the appliance conforms to the Indian Standard in every respect.

9. MARKING

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

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

b) Capacity of the fire engine in LPM, and

e) Year of manufacture.

d) Emboss the name and emblem of both BHEL and CISF on either side of the vehicle. The emblem of CISF and BHEL shall be provided to the party after placing the P.O.

10. INSPECTION: 3 stage inspection/test of the above Fire Jeep Engine shall be carried out at the supplier site by our inspecting officials.

1ST STAGE: Preliminary inspection covering inspection of Chassis and Construction of understructure, Tank & Sheet Thickness Measuring. Hydraulic testing of Water Tank. Welding should be carried out by qualified welder. All welding joints are to be tested by D.P.Test.

2ND STAGE: Fitment of the PTO & Pumps, placement of the HP Tested Water tank Hydraulic Testing of pipeline and Valve, paneling of sheets, fittings Lockers & drawer, Fitment of cooling bypass valve and pipeline leading to heat exchanger and suitable connection for its outlet, preliminary test of pump, working of PTO, operation of Exhaust Ejector primer etc while checking all relevant parameters.

3RD STAGE: In final stage, performance verification of all other normal items of equipment, fitments, appurtenances, light, fog lamps, search light, revolving blinker, spot light, rear warning lighting as per specified standard system & will carried out. Suction Test to be carried out with new Suction hoses supplied/provided with new Fire Tender. Following **"Acceptance Test"** on various equipment shall be conducted to meet Parameters.

01. Endurance Test of Centrifugal Pump.

02. Gradient Test.

03. Stability Test: The stability of the appliance will be such that when under fully equipped& laden condition, if the surface on which the appliance stand it titled to either side, the point at which over turning occurs is not passed at an angle of 27^{o} from horizontal. This Stability Test will be carried out on a Mechanical Tilt Platform & not missionary ramp. For carrying out this test, the bidder should necessarily have Mechanical tilt platform facility at their own manufacturing Unit. The rating of pump would be minimum 4 hrs. The priming will be tested as per standards. All the Water piping will be subjected to hydraulic test pressure of $15Kg/cm^2$ for a period of minimum 10 minutes.

04. Hydraulic Pressure Test of Tanks & High Pressure Piping.

05. Vacuum Test.

06. Deep Lift Test.

APPENDIX-A

Schedule of equipment and quantity likely to be carried on the appliance

SLNO	EQUIPMENT	QUANTITY
01	Suction hose, 75mm size, 2-5 m length(see IS: 2410-1963*)	3
02	Delivery hose, 15 mtrs 63 mm size, lined(see IS: 636-1962†)	6
03	Delivery hose, 15 mtrs 63-mm size unlined (see IS: 4927-1968†)	6
04	Delivery hose, 63-mm instantaneous hydrant outlet	1
05	Suction wrenches for 75-mm size suction hose(see IS: 4643-1968)	1 pair
06	Spade	1
07	Branch pipe, ordinary (see IS: 2871-1965)	1
08	Brach pipe universal (see IS:2871-1964	1
10	Hydrant key(see IS: 910-1972)	2
11	Hose bandages(see 5612-1969	1
12	Fire hook(see 927-1964	1
13	Firemen's axe (see IS: 926-1970)	2
14	Crow bar(see IS:704-1968*)	1
15	Shovel (see IS: 274(Part I and Part II) -1966	1
16	Alloy aluminum extension Ladder 4.5m (see IS: 4571-1968)	1
17	Insulated plier(see IS: 6078-1971)	1
18	First-aid box for six persons	1
19	Torch flash light, 3 cells (see IS: 2083-1962	2
20	Fire bucket(see IS:2546-1947)	4
21	Fire extinguisher CO_2 type (2kg) (see IS: 2878-1964)	1
22	Metal strainer to suit 75 mm suction hose (see IS:907-1965)	1
23	Basket strainer with canvas skirt (see IS:3582-1966)	1
24	Fire beater	1
25	Ropes manila, 30 m (see IS: 1084-1969	1