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*Draft Indian Standard*

**SPECIFICATION FOR AIRCRAFT FUEL SERVICING VEHICLES**

ICS 43.040, 43.020

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Automotive Body, Chassis and Accessories Evaluation Sectional Committee, TED 6

## FOREWORD

This Indian Standard will be adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Body, Chassis and Accessories Sectional Committee had been approved by Transport Engineering Division Council.

This standard was first published in 1979 to Covers the Specifies the requirements for the design and construction of vehicles for servicing of aircraft with standard grades of aviation fuel operated by the vehicle engine and for facilities for loading the cargo tanks of these vehicles. In this Revision references were updated in view the technological advancements that have taken place since its last Publication.

This standard has been based on the information supplied by the Directorate of Technical Development and Production (Air), Ministry of Defence, New Delhi.

The composition of the committee responsible for formulation of this standard is given as **Annex A. (Will be added later)**

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Draft Indian Standard***SPECIFICATION FOR AIRCRAFT FUEL SERVICING VEHICLES****1 SCOPE**

Specifies the requirements for the design and construction of vehicles for servicing of aircraft with standard grades of aviation fuel operated by the vehicle engine and for facilities for loading the cargo tanks of these vehicles.

NOTE 1 — Aircraft fuel servicing tank vehicles which are used on public highways shall also comply with the statutory requirements for plying on such highways in addition to the stipulations of the Indian Petroleum Manual.

NOTE 2 —

Covering Nothing given in this standard is intended to contravene any provisions of the statutory requirements the design, fabrication and use of aircraft fuel servicing vehicles.

**2 REFERENCES**

The standards given below contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

<i>IS No.</i>	<i>Title</i>
IS 5797 : 2022/ ISO 1825:2017	Rubber Hoses and Hose Assemblies for Aircraft Ground fuelling and defuelling Specification (Fifth Revision)
IS 7264: 1974	Dimensions for aircraft pressure refuelling connection

**3 TERMINOLOGY**

**3.1 Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Dispenser)** — A vehicle equipped with facilities to transfer fuel between an aircraft fuel hydrant and an aircraft.

**3.2 Aircraft Fuel Servicing Tank Vehicle (Fueller)** — Any vehicle (tank truck, tank fuel trailer, tank semitrailer, tank vehicle) designed for or employed in the transportation or transfer of fuel into or from an aircraft.

**3.3 Aircraft Servicing Ramp or Apron** — An area or position at an airport used for the fuel servicing of aircraft.

**3.4 Baffle** — A non liquid-tight transverse partition in a cargo tank.

**3.5 Bulk-head** — A liquid-tight transverse closure between compartments of a cargo tank.

**3.6 Carcass Saturation** — This refers to the condition where fuel has permeated the reinforcement materials of a hose carcass.

**3.7 Cargo Tank** — Any container which has a liquid capacity above 500 litres used for carrying aircraft fuel and mounted permanently or otherwise secured on a tank vehicle. This term does not apply to any container used for the purpose of supplying fuel for the propulsion of the tank vehicle on which the cargo tank is mounted.

**3.8 Compartment** — A liquid tight division in the cargo tank.

**3.9 Deadman Control** — A device which will not allow the flow of fuel from the system to any hose in the system supplying fuel to the aircraft unless the control is held open by an operator.

**3.10 Deck Platform** — A platform which is either fixed or movable to facilitate the fuelling connection between the vehicle and aircraft.

**3.11 Fixed Fuelling System** — An arrangement of aviation fuel storage, pumps, piping and associated equipment and dispensing hydrants, cabinets and/or pits at an airfield designed to service aircraft from locations established by the installation of the equipment.

**3.12 Fueller** — (*see* Aircraft Fuel Servicing Tank Vehicle)

**3.13 Fuel Servicing** — The fuelling and defuelling of aircraft fuel tanks. This does not include fuel transfer operations and testing aircraft fuel systems during maintenance-and overhaul of aircraft.

**3.14 Fuel Servicing Cabinet** — A fully enclosed structure above the surface of the ground from which it is possible to dispense fuel into aircraft without any additional equipment.

**3.15 Fuel Servicing Pit** — A pit suitably covered flush with the ramp containing all equipment which make it possible to dispense fuel into aircraft without additional equipment.

**3.16 Fuel Storage Facilities** — Fuel storage facilities for airport installations may be provided in one and/or both the following ways:

- a) Primary storage facilities — Tanks for storage of aviation fuel and associated facilities which are generally located remotely from aircraft servicing and movement areas.

- b) Operating storage facilities — When provided, these are of smaller capacity than the primary storage facilities and are generally located as close as practical to the aircraft servicing aprons.

**3.17 Head and Bulk Head** — A liquid-tight transverse closure at the end of the cargo tank.

**3.18 Hydrant** — An outlet in a fixed fuelling system designed to permit the transfer of fuel only after the matching fuel connection on the dispensing equipment is properly attached.

### **3.19 Pressure**

- a) Burst pressure — This is the pressure at which any randomly selected component will rupture.
- b) Design pressure — The pressure for which a system or component is designed. It shall always be equal or exceed the service pressure which include surge pressure. The design pressure shall never be exceeded except during pressure tests.
- c) Operating pressure — The pressure existing in a system under either flow or static conditions against pump's maximum no flow head but excluding surge pressures.
- d) Service pressure — The maximum pressure excluding test pressure to which a system or component may be subjected. It includes any surge pressure which may be developed in the system.
- e) Test pressure — The pressure to which the system or a component of such system is tested to verify the integrity of the system or the component. It may be expressed as a percentage of the service pressure or the design pressure.

**3.20 Standard Grades of Aviation Fuel** — A fuel of whatever octane rating used in aircraft including aviation gasoline and blends of hydrocarbons commonly referred to as Jet Fuels.

**3.21 Tank Fuel Trailer** — A vehicle that is not self-propelled and which has a cargo tank mounted thereon or built as an integral part thereof and used for the transportation of aviation fuel and so constructed that practically all of its weight and load rests on its own wheels.

**3.22 Tank Semitrailer** — A vehicle that is not self-propelled, which has a cargo tank mounted thereon or built as an integral part thereof and used for the transportation of aviation fuel and so constructed that when drawn by a tractor by means of a fifth wheel connection some part of its weight and load rests upon the towing vehicle.

**3.23 Tank Truck** — Any single self-propelled motor or vehicle equipped with a cargo tank mounted there on, and used for the transportation of aviation fuel.

**3.24 Tank Vehicle** — Any tank truck, tank fuel trailer or tractor and tank semitrailer combination.

**3.25 Transfer Pipeline** — Piping used to transfer fuel between the main storage facility, the operating storage tanks, if any and the hydrant.

## **4 DESIGN AND CONSTRUCTIONAL REQUIREMENTS**

### **4.1 Cargo Tanks**

**4.1.1** Cargo tanks shall be constructed of mild steel (low alloy) low carbon (high tensile) steel and aluminum alloys or any other suitable material as may be approved by the statutory authorities from time to time. The material used shall comply with the specification mutually agreed between the supplier and the purchaser. The steel tanks shall be suitably lined inside with a non-corrosive coating fully compatible with all grades of aviation fuel that are likely to be used. The tank shall be designed to be of maximum cross-section so as to reduce length but shall be of such shape that it shall sit on the chassis as low as possible. It should be of robust construction for the carriage of the designed quantity of fuel without skin or gusset failure occurring in operation.

**4.1.1.1** Tanks constructed of aluminium alloys shall be of all welded construction. The welded joints shall be made in accordance with recognized good practice by an inert gas/arc welding process using appropriate electrodes.

**4.1.1.2** At the time of manufacture, every cargo tank shall be tested by a minimum air or hydrostatic pressure of 20 kPa applied to the whole tank or each compartment thereof, if the tanks are compartmented. Such pressure shall be maintained for a period of at least five minutes, during which, if the test is by air-pressure, the entire exterior surface of all the joints shall be coated with a solution of soap and water, heavy oil, or other material suitable for the purpose, foaming or bubbling of which will indicate the pressure of leaks. Hydrostatic pressure, if used, shall be gauged at the top of the tank. The tank shall be inspected at the joints for the issuance of liquid to indicate leaks. Any leakage discovered by either of the methods described, above, or by any other method, shall be deemed as evidence of failure to meet the requirements of this specification.

**4.1.2** Cargo tanks piping and connections - Magnesium shall not be used in the construction of any portion of an aircraft fuel servicing tank vehicle.

#### **4.1.3 Bulk Heads**

Aircraft fuel servicing tank vehicles used solely on an airport shall not be required to have bulk heads or compartments.

#### **4.1.4 Baffles**

Every cargo tank shall be provided with baffles, the number of which shall be such that the linear distance/liquid capacity between any two adjacent baffles or between any tank head or bulk head and the baffles nearest it, shall not exceed 1.5 meters/5000 liters, whichever is less. The cross-sectional area of each baffle shall be not less than 80 percent of the cross-sectional area of the tank and the thickness of such baffles shall be not less than that required for heads and bulk heads of the cargo tank in which installed.

#### **4.1.5 Venting of Cargo Tanks**

The tank shall be fitted with manholes, with cover and vents. Each cargo tank shall be provided with a normal vent having a minimum through area of 285 mm<sup>2</sup>. The pressure vent shall be set to open at not more than 7 kPa pressure and vacuum vents shall be designed to prevent loss of liquid through the vent in case of vehicle upset. If the tank is designed to be loaded or unloaded with the manhole cover/covers closed, the vent or vents shall be designed to limit the vacuum to 7 kPa and the tank pressure to 20 kPa on the basis of maximum product transfer rate. Unless effective protection against overflowing is made to prevent the pressure from exceeding 20 kPa in case of accidental overflowing, the minimum venting capacity for pressure actuated vents shall be 170 m<sup>3</sup> of air per hour at 35 kPa. Pressure actuated devices shall be designed so as to prevent leakage of liquid past the device in case of surge or vehicle upset but shall function in case of pressure rise when in upset position.

##### **4.1.5.1 Total Capacity For Venting**

Each cargo tank shall be provided with one or more devices as above with sufficient capacity to limit the tank internal pressure to 35 kPa. If the pressure actuated venting does not provide adequate venting additional capacity shall be provided by adding fusible venting devices each having a minimum area of 800 mm<sup>2</sup>. Fusible vent or vents shall be actuated by elements which operate at a temperature not exceeding 120°C. Not less than two such devices shall be used on any cargo tank. At least one such device shall be located close to each end of the cargo tank or tank compartment. The other vents shall be located near the centre of the tank to minimize surge spillage when the vehicle is stopping or accelerating.

Each venting device shall be flow tested in the ranges specified in the applicable preceding paragraphs. The actual rated flow capacity of the vent at the pressure at which it is determined shall be stamped on the device. The fusible vent shall have its flow determined at 35 kPa differential.

#### **4.1.6 Manhole Covers**

Manhole dome covers shall be provided with a forward mounted operating hinge, self latching catches to hold the cover closed, and fitted with liquid-tight seals or gaskets designed to prevent spillage or leakage from overturn or the weather. Flashing shall be provided around manhole dome covers to prevent spilled fuel from draining near possible sources of ignition including the engine,

the engine exhaust system, electrical equipment or into any portion of the vehicle housing auxiliary equipment.

The manhole opening shall be protected against overturn damage by rigid member/members firmly fixed to the tank and extending a minimum of 25 mm above any cover, handle, vent opening or projection of the unit. Overturn protection shall be adequately braced to prevent collapse. Where overturn protection creates a trough or pocket apt to collect rain water it shall have a drain that is exterior to the cargo tank.

#### **4.1.7 Pipe Ines**

All pipe lines for product discharge and intake shall be of adequate cross-section and rated for at least 800 kPa. Elbows and fittings shall be kept to a minimum and where used shall be of the preformed welding type. All pipe lines and fittings shall be of aluminum alloy or any other suitable material. Flanged connections and approved flexible couplings shall be provided wherever necessary to facilitate easy servicing and replacement of components and also to avoid failure due to chassis flexures. Brackets or supports shall be used to provide rigidity to the piping and to support it if any section or component is removed for servicing.

All openings in the cargo tank compartments connected to pipe or tubing shall be plugged unless the pipe or tubing is fitted with a spring loaded check valve, a self-closing valve or similar device to prevent the accidental discharge of fuel in case of equipment malfunction or line breakage. On tank fuel trailers or tank semitrailer units the use of a pump on the tractor unit with flexible connections to the trailer shall be prohibited unless the flexible connections are arranged above the liquid level of the tank in order to prevent gravity or siphon discharge in case of break in the connection or piping.

#### **4.1.8 Tank Outlet Valves**

The outlet/outlets of each cargo tanks shall be equipped with a reliable and efficient shutoff valve/valves located inside the shell or in the sump when it is an integral part of the shell and designed so that the valves shall be kept closed except during loading and unloading operations.

The operating mechanism for each tank outlet valve shall be adjacent to the fuel delivery system operating controls and shall be arranged so that the outlet valves may be simultaneously and instantly closed in the event of fire or other emergency. There shall also be a secondary control for each shut off valve. The secondary control mechanism shall be easily accessible but remote from all openings and discharge faucets.

### **4.2 Fuel Dispensing System**

**4.2.1** The fuel dispensing which would comprise of the pump, flow metres, air eliminator, filter separator and hose reels, shall be suitably mounted on an independent sub-chassis frame which is



independent of the vehicle or the trailer chassis and which can be assembled by means of suitable threaded fasteners to the vehicle or trailer chassis. If there are more than one dispensing system, each system shall be provided with an isolating valve at a convenient location so that any one system not in use may be completely isolated from the pressure control valve.

#### **4.2.2 Pump**

The fuel dispensing system shall incorporate a pump specially designed and constructed for handling aviation grade fuels. It shall be capable of withstanding the design and test pressures of the system and deliver the fuel at the rated flow and pressure to aircraft. The pump shall incorporate conducting mechanical seals to avoid fire hazards due to static charges.

The pump shall be compact in size and capable of being driven by the chassis/tractor engine or by a separate engine as the case may be depending on the design of the system, The suction and delivery posts of the pump shall be of such sizes to afford a clear liquid way for drawing fuel from the cargo tank and deliver it through the system with minimum pressure losses.

#### **4.2.3 Pressure Control Valve**

The system shall incorporate a pressure control valve (PCV) so that fuel is delivered to aircraft at a desired preset pressure. The PCV shall be of either the restricter type or the by-pass type and shall operate on the pressure of the fuel sensed at the end of the hose delivering fuel to the aircraft or by any other means which simulate the pressure obtained at the hose end. The operation of the valve shall be through a calibrated spring air pressure bias or fuel pressure.

#### **4.2.4 Fuel Metering Equipment**

The system shall contain one or more metering equipment that would measure accurately the fuel delivered to aircraft within the limits of accuracy specified by the statutory authority concerned. The meter shall be designed to withstand the fuel system design and test pressures and be capable of handling all grades of aviation fuel and the rated flow. Means shall be provided to indicate the rate of flow of the fuel being delivered to the aircraft, if required by the purchaser.

In addition, each cargo tank shall be provided with a calibrated dip-stick indicating the contents of the tank in litres. The dip-stick shall be calibrated to the required accuracy specified by the statutory authority concerned.

#### **4.2.5 Filter/Water Separator**

The system shall incorporate a fuel filter or a filter-cum-water separator of sufficient capacity and flow rate, so that all fuel delivered to aircraft at a time are filtered to remove solid particles and water to a degree and efficiency as agreed to by the supplier and the purchaser. The filter/water

separator body and the elements used shall be suitable for use with all grades of aviation fuel. The unit shall incorporate a means to measure pressure differential across it.

#### **4.2.6** *Air Eliminator*

An air eliminator shall be provided before the fuel metering equipment to remove all traces of air from the fuel flowing through the meters.

#### **4.2.7** *Hose Reels*

To facilitate storage and ground handling of delivery hoses, one or more hose reels may be incorporated. Each reel shall provide storage for the required length of hose of prescribed diameter. The drum diameter of the reel shall be greater than the minimum diameter of service reeling drums specified in IS: 5797-2022/ISO 1825: 2017 'Rubber Hoses and Hose Assemblies for Aircraft Ground Fuelling and Defuelling Specification (Fifth Revision)'. Arrangements shall be made for rewinding the hose manually or by power as required. The hoses shall be coupled to the hose reel in a manner which will prevent undue bending action or mechanical stress on the hose or hose couplings.

#### **4.2.8** *Fuelling Hoses*

The system shall be provided with one or more hoses of the specified diameter and length. The hoses shall comply with IS: 5797-2022/ISO 1825: 2017. If required the valve which monitors the flow of fuel from and aircraft fuel servicing vehicle shall have a Deadman control which shall be held by the fuel serviceman to permit flow of fuel. The flow control system shall be designed to minimize surge pressure ahead of the flow control valve, when it is closed. The hose coupling connection shall conform to IS: 7264-1974 'Dimensions for aircraft pressure refuelling connection'.

#### **4.2.9** *Nozzles and Couplings*

Nozzles for overwing servicing shall not have notches or latches in the handle which could allow the valve to be locked open. They shall also be provided with bonding clip and wire for connecting to the aircraft being serviced.

Couplings for underwing servicing shall be designed so that they shall be securely seated and locked in the mating connection on the aircraft before the poppet valve is opened. It shall not be possible to disengage the nozzle from the aircraft fitting until the poppet valve is fully closed.

#### **4.2.10** *System Layout*

The layout of the fuel dispensing system shall be compact and shall provide easy access to different parts so that servicing, dismantling and re-assembly operations are not difficult.

All controls, meters and instruments are to be so grouped that fuel dispensing operations is controlled by a single operator. Fuel connections which are liable to be made or broken at fairly regular intervals and in which there is a likelihood of fuel remaining are to be of non-ferrous material preferably gun-metal/bronze conforming to recognized standards. The connections should be so designed that fuel leaks could be easily detected and rectified.

Foot-holds, handgrips, access ladders and walkways are to be provided as required. These are to be of the non-slip type. All fuel seals, packings and washers are required to be suitable for use with all grades of aviation gasoline and turbine fuel.

#### **4.3 Exhaust System**

No portion of the exhaust system of the engine(s) shall be located beneath or near the servicing platform or any part of the cargo delivery system. Where required, adequate shielding shall be installed so that fuel spillage from the cargo tank vent or overflow systems does not come into contact with the exhaust system(s).

Flame arrestor(s) of an approved design shall be fitted to the exhaust pipe(s) of the engine(s).

#### **4.4 Vehicle Fuel System**

Vehicle fuel system shall be so designed, constructed and installed as to present no unusual hazard and no part of any fuel tank or container or intake pipe shall project beyond the overall width of any tank vehicle upon which it is mounted. All fuel tanks shall be so arranged as to vent during filling operations and to permit drainage without removal from their mountings.

#### **4.5 Vehicle Brakes**

Vehicle brakes shall be of acceptable commercial quality for this type of vehicle services.

Each fuel trailer, and semitrailer shall be equipped with reliable brakes on all wheels, and adequate provision shall be made for their efficient operation from the driver's seat of the vehicle drawing the trailer or semitrailer.

If so required suitable arrangement shall be made so that vehicle brakes are kept applied when the vehicle is fuelling/defuelling an aircraft. This device shall have an over-riding emergency release.

#### **4.6 Fuel Trailers and Semitrailers**

Trailers shall be firmly and securely attached to the vehicle drawing them, in a manner conforming with recognized good practice.

Trailer connections shall be such as to prevent the towed vehicle from whipping or swerving from side to side dangerously or unreasonably and shall cause the trailer to follow substantially in the path of the towing vehicle.

#### **4.7 Electrical System**

The electrical system shall incorporate a master isolating switch located in the driver's cab, to conform to petroleum regulations. The circuitry shall be heavily insulated and the wiring shall be so fixed and protected as to reduce as far as possible the risk of damage. The generator, battery, switches and fuses shall be carried in front of fire resistant screen ahead of the fuel dispensing system and cargo tank. Means of cutting off the current supply close to the battery by a switch shall be provided. All wiring is to be carried out with oil resistant cables encased in metallic conduits. All circuits shall have over-current protection. Terminal connections shall be firmly attached with snap-or screw type end fittings. The vehicle shall be provided with lights and other fittings as agreed to between the supplier and purchaser.

Electrical service wiring between the tractor and cargo tank on a fall trailer or semitrailer vehicle shall be designed for heavy duty service. The cable shall mate with a multi-connector plug terminal mounted on the trailer. The connector shall engage a positive device.

**4.8** The vehicle shall be provided with suitable deck platform, if require.

### **5 SAFETY REQUIREMENTS**

#### **5.1 Electrostatic Protection**

The vehicle shall be bonded electrically throughout. The cargo tank, the fuel dispensing unit, the tractor and the trailers are to be fitted with positive electrical connections. Earthing spikes and bonding leads with end fittings and length of conductors shall be provided to the mutual agreement of the supplier and purchaser. Instructions for bonding and earthing are to be prominently marked on- the vehicle/trailer. Suitable bonding strips between the ends of pipes and unions are to be provided. Earthing aluminum plate for concrete surfaces shall also be provided.

#### **5.2 Fire Protection**

The vehicle shall be adequately protected against fire by means of dry chemical fire extinguisher. The equipment needed in this respect would depend on the type of vehicle, that is, fixed chassis/tractor trailer combination and the quantity of fuel carried in the cargo tank, and shall be supplied according to the mutual agreement between the supplier and the purchaser.

**5.2.1** Extinguishers shall be mounted in a location remote from probable fire hazards. Extinguishers located in enclosed compartments shall be readily accessible and their location shall be clearly marked in letters at least 50 mm high.

**5.2.2** ‘No smoking’ notices shall be prominently displayed on the refueler body on all four sides.

## **6 PERFORMANCE**

The system would be capable of fulfilling one or more of ‘the following performance requirements as mutually agreed to between the purchaser and the supplier:

- a) To fuel aircraft;
- b) To defuel aircraft;
- c) To fill up its own cargo tank from an outside source, such as an underground or over ground tank by its own power;
- d) To act as a fuel dispensing system between an aircraft, and an outside source of fuel;
- e) As a hydrant dispenser;
- f) Circulation of the product in the cargo tank; and
- g) To fill up the cargo tank by its own power from barrels.

The system shall be so engineered to meet the above performance requirements without any chance of entry of extraneous matter into the fuel system.

## **7 NAME PLATES**

All important components of the fuel dispensing system shall bear metal nameplates as mutually agreed to between the purchaser and the supplier.

## **8 STORAGE SPACE**

Adequate storage space shall be provided for storing safely all loose equipment required to carry out any of the functions given in 5. In addition, storage space shall also be provided for any test equipment required to be carried with the vehicle.

## **9 GAUGES AND CONTROLS**

Gauges and controls are to be provided as specified by the purchaser and agreed to by the supplier. They shall be grouped together and mounted on a conveniently located panel so that operations are controlled by one man.

## **10 PROTECTIVE TREATMENT**

The vehicle shall be treated and painted to prevent corrosion by weathering and by contact with all grades of aviation fuel. The type of paint used shall be mutually agreed to between the supplier and the purchaser.

## **11 TESTING**

The vehicle shall be subjected to inspection and testing as mutually agreed to between the supplier and the purchaser.

**ANNEX A**  
*(Foreword)*

**COMMITTEE COMPOSITION**

Automotive Body, Chassis and Accessories Evaluation Sectional Committee, TED 6

**Will be added later**