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IS 10993 (1984): Functional requirements for 2000 kg dry powder tender for fire brigade use [CED 22: Fire Fighting]



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“Knowledge is such a treasure which cannot be stolen”

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IS : 10993 - 1984
Reaffirmed 2010

Indian Standard

FUNCTIONAL REQUIREMENTS FOR 2 000-kg DRY POWDER TENDER FOR FIRE BRIGADE USE

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

FUNCTIONAL REQUIREMENTS FOR 2 000-kg DRY POWDER TENDER FOR FIRE BRIGADE USE

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AMENDMENT NO. 1 JANUARY 1989
TO
IS : 10993 - 1984 FUNCTIONAL REQUIREMENTS
FOR 2 000-kg DRY POWDER TENDER FOR FIRE
BRIGADE USE

(*Page 6, clause 4.4.1*) — Insert the following after the first sentence:

“The vessels shall conform to IS : 7285-1982 ‘Specification for seamless manganese steel cylinders for permanent and high pressure liquefiable gases (*first revision*)’.”

(*Page 7, clause 4.4.1, last line*) — Substitute ‘0.012 mm’ for ‘0.12 mm’.

(*Page 7, clause 4.4.3, first line*) — Substitute ‘2.5 kg’ for ‘5 kg’.

(*Page 7, clause 4.4.3, para one, last line*) — Delete the words ‘and 30 m vertically’.

(*Page 8, clause 4.4.7, para two, line 3*) — Substitute ‘vertically’ for ‘horizontally’.

(*Page 8, clause 4.4.7, para two, line 4*) — Substitute ‘horizontally’ for ‘vertically’.

(*Page 8, clause 4.4.8, para two, line 3*) — Substitute ‘2.5 kg’ for ‘5 kg’.

(BDC 22)

Indian Standard

FUNCTIONAL REQUIREMENTS FOR 2 000-kg DRY POWDER TENDER FOR FIRE BRIGADE USE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 April 1984, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Dry powder tender of higher capacity has become a part of the modern equipment of refineries, industries using or processing chemicals, airports and town fire brigades. The appliance is intended to use dry chemical powder, foam compatible type, with nitrogen as expellent gas.

NOTE — Dry powder tender of 150 kg capacity is covered in IS : 955-1980*.

0.3 Dry powder being one of the most effective media for dealing with Class B and Class C fires, the appliance is especially suited for fighting large fires effectively, particularly where flowing liquids are involved. The powder is quite safe for use on electrical apparatus but, owing to the dust evolved, which may adversely affect the machinery or switchgear, care should be taken to clean the same thoroughly and immediately after extinction of fire.

0.4 A provision of long-range monitor, on the top of the appliance, has been made to attack fires which are not approachable by hose. Hoses, however, have their own advantages to deal with spillage and/or running fires and also at places which can not be attacked by the monitor.

0.5 It is essential to flush the dry powder unit after use.

0.6 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, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Functional requirements for dry powder tender for fire brigade use (*first revision*).

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard lays down requirements regarding materials, design and construction, workmanship and finish, and accessories and equipment for dry powder tender of 2 000 kg capacity for fire brigade use.

2. GENERAL REQUIREMENTS

2.1 The appliance shall have a dry powder unit to contain 2 000 kg of dry powder in vessel(s). The dry powder unit itself shall have the expellant gas assembly to discharge powder through 2 hose-reels fitted with trigger type pistol grip nozzle and/or a monitor.

2.2 The appliance shall be fabricated in a manner so as to conform to the following requirements:

- a) The gross vehicle mass, including crew, dry powder and equipment, shall be not less than 8 500 kg.
- b) The maximum speed of the appliance on level road, when fully laden, shall be 72 km/h.
- c) The acceleration of the appliance from a standing start through the gears, when fully laden, shall be 63 km/h in 55 seconds.
- 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 4 500 mm
Turning circle	Not more than 20 m
Road clearance	Not less than 230 mm
Overall width	Not more than 2 500 mm

2.3 The appliance shall be fitted with a towing arrangement at the rear of adequate strength to carry 1-tonne trailer. The unit shall be well balanced on the chassis and shall have centre of gravity as low as possible. The overall height shall not exceed the permissible limits.

3. MATERIAL SELECTION AND TREATMENT

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

3.2 The appliance is intended for use in tropical conditions with constant high humidity and heat. This shall be given full consideration while selecting the materials and, for this reason, use of rubber or other similar materials shall be avoided as far as possible; where it is unavoidable, the parts made out of these materials shall be easily replaceable and easily available.

3.3 All metal parts exposed to atmosphere and coming in contact with the powder shall be either of corrosion-resistant material or treated suitably to resist corrosion.

3.4 Ferrous metal shall not be used for chromium-plated fittings, and the plating of all such fittings shall be of extra-heavy quality.

4. DESIGN AND CONSTRUCTION

4.1 Engine

4.1.1 The engine shall be of compression ignition type and shall be capable of driving the fully laden appliance from starting-up without any preliminary running period even under abnormally cold atmospheric conditions. Means shall be provided to ensure reliable and quick starting of the engine.

4.1.2 Suitable gauges for indicating temperature of water and for oil pressure, appropriately marked with normal operating ratings, shall be provided on the instrument panel in the driver's cab. The engine lubricating system shall be provided with an accessible external filter. Means shall be provided to gauge with reasonable accuracy the level of oil in the sump, preferably by a tubed dip-stick.

4.2 Electrical System

4.2.1 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.

4.2.2 All important electrical circuits shall have separate fuses, suitably indicated, which shall be grouped into a common fuse-box located in an accessible position in the 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.

4.3 Body Work

4.3.1 The body shall provide enclosed accommodation for two persons including the driver. Both the seats will be independent. The cabin shall have two doors, one on either side. The doors shall be hinged in front, opening outwards and shall have double-catch striking plates. The rear body shall provide accommodation for the dry powder vessels and the equipment mentioned in Appendix A. The flooring for the rear

body shall preferably be provided with light alloy chequered plates.

4.3.2 In addition to the enclosed accommodation, riding position shall be provided for 2 persons on a platform at the rear of the appliance. Grab rails and non-skid steps shall be provided, wherever required, to assist the crew to mount and dismount.

4.3.3 Sufficient number of lockers for the stowage of the equipment, tools, and other items shall be provided. The lockers shall be fitted with waterproof lining.

4.3.4 The cab and the 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 super structure.

4.3.5 All lockers shall be provided with internal automatic on-off lighting system with a master switch in the cab. The doors of the lockers shall have efficient means for holding them closed by flush-fitting spring-loaded locks. The doors of the side lockers shall not be hinged at the bottom.

4.3.6 If required, provision for wireless equipment shall be made and the control panel of the wireless equipment shall be located in the driver's cab.

4.3.7 A battery-operated public address system, with amplifier and microphone in the cab, shall be provided.

4.3.8 All light fittings at the rear shall be suitably protected by expanded metal to prevent damage due to movement of the crew.

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

4.4 Dry Powder Fire Extinguishing Equipment

4.4.1 A quantity of 2 000 kg of dry powder of the foam compatible type, conforming to IS : 4308-1982* shall be stored either in a single vessel or in 2 vessels of capacity 1 000 kg each. Each vessel shall be provided with a separate filling aperture with cover, drain plug, safety valve, pressure gauge, isolation valve, discharge valve, etc, at suitable locations. Arrangement shall be provided to expel the powder through the monitor or 2 hose-reels or both at a time. Where 2 vessels are used, a common manifold shall preferably be provided for discharge. The 2 vessels shall not have any interconnection. Each vessel shall be connected

*Specification for dry powder for fire fighting (*first revision*).

to a separate expellent gas supply and fitted with a suitable pressure reduction valve. The vessels shall have treatment for anti-corrosion on internal surface, either of lead-tin alloy (tin not less than 10 percent) having minimum thickness of 0.12 mm, or of epoxy paint.

4.4.2 A long-range monitor shall be mounted on an independent platform just behind the driver's cab. The platform shall be adequately strengthened to avoid any vibration while the monitor is in use. There shall be proper and sufficient moving space around the platform for movement of the operator.

4.4.3 The discharge rate of the powder shall be not less than 5 kg per second through each hose-reel and the throw shall be not less than 10 m horizontally and 8 m vertically while working with both the lines. The discharge through the monitor shall be adjustable at 15, 25 and 40 kg/s at operating pressure. The throw through the monitor shall be not less than 40 m horizontally and 30 m vertically in still air.

The total discharge of the powder shall be not less than 90 percent of the total contents. The vessels shall be provided with arrangement for discharging the excess expellent gas into the atmosphere even if the vessel is full with dry powder, the excess air should not affect the powder charge.

4.4.4 Efficient means shall be provided for flushing the monitor, hose-reels and manifold with the expellent gas after use. The operating lever shall be located at the control panel.

An additional connection shall be provided in the common manifold, with required valve connection, to flush out the powder in the monitor and hose-reels using air from outside source.

4.4.5 The expellent gas system shall preferably have nitrogen gas in cylinders of capacity not less than 50 litres each, having filling pressure of not less than 200 kgf/cm². The gas shall be sufficient to discharge 2 000 kg of dry powder through the long-range monitor and hose-reels in accordance with the requirements of 4.4.3.

4.4.6 Sufficient amount of the expellent gas shall be available in the cylinders to flush the monitor, hose-reels and manifold when the supply of powder is exhausted. Arrangement shall be made to prevent back-flow of the expellent gas.

4.4.7 The monitor shall be provided in a manner so as to enable the operator to move it easily. The monitor shall rest on a clamp, properly secured, while not in use.

The monitor shall have in-built arrangement to regulate the powder discharge at 15, 25 or 40 kg/s by pushing or turning the operating lever. It shall be capable to work on any angle up to 360° horizontally and 100° vertically. Suitable controls shall be provided near the grip of the handle to facilitate the operator to control and regulate the discharge of the powder.

4.4.8 Two hose-reels, one on either side of the appliance, shall be provided at easily accessible locations so as to facilitate quick withdrawal. Arrangement shall be made to prevent over-running of the reels.

Each reel shall be provided with 30 m long high-pressure rubber hose fitted with trigger type pistol grip nozzle capable of discharging 5 kg of powder per second at a pressure 14 kgf/cm².

4.4.9 Suitable device shall be provided or arrangement made to restore the fluidity of the powder to ensure its capability to flow through the fittings, valves and pipelines to the outlets.

4.4.10 All valves, discharge nozzles, pipes and fittings, pressure gauges, etc, shall be of approved type and of non-corrosive/non-reactive material compatible with the dry powder.

4.5 Control Panel

4.5.1 Adequately illuminated control panel shall be provided at easily accessible position to operate the dry powder system. All controls/items of equipment shall be clearly marked or identified by fixing suitable labels to facilitate easy operation.

4.5.2 The control panel shall include the following:

- a) Pressure gauge for expellent gas cylinders;
- b) Pressure gauge to indicate operating pressure;
- c) Operating levers for:
 - 1) expellent gas valve,
 - 2) monitor valve,
 - 3) valves for hose-reels,
 - 4) pressure release valve,
 - 5) flushing valve for monitor, and
 - 6) flushing valves for hose-reels;
- d) Switches for lighting arrangement; and
- e) Instruction plate for operation, with line diagram.

4.6 Stability — The stability of the appliance shall be such that when under fully equipped and loaded conditions, excluding the 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 25° from the horizontal.

5. WORKMANSHIP AND FINISH

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

5.2 All metallic surfaces coming in contact with the dry power shall be suitably treated against corrosion.

5.3 The appliance shall be painted fire-red to Shade No. 536 of IS : 5-1978*. The paint shall conform to IS : 2932-1974†.

6. INSTRUCTION BOOK(S), ACCESSORIES AND EQUIPMENT

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

6.2 Accessories — The following accessories shall be fitted/provided in addition to those normally fitted on commercial vehicles:

- a) *Electrically operated siren* — 1 km working on the batteries of the appliance, with its switch in the driver's cab. The siren shall be fitted at a position where it is protected from damage due to weather conditions.
- b) *Fog lamps* — two.
- c) *Reversing light* — suitably situated to assist reversing.
- d) *Airfield obstruction marking lights* — two. One of these shall be fitted in the front and the other at the rear of the appliance.
- e) *Revolving beacon-light* — of blue colour, capable of throwing beams of blue light around 360° with beams inclined upwards, horizontally and downwards. It shall be mounted on the cab roof and shall be operated from the batteries of the appliance.
- f) *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

*Colours for ready mixed paints and enamels (*third revision*).

†Specification for enamel, synthetic, exterior, (a) undercoating, (b) finishing (*first revision*).

with tripod and with not less than 30 m of TRS cable on a reel mounted on the appliance. The capacity of the cable shall be such that the voltage drop shall be not more than 2 V at the other end.

- g) *Spot light* — adjustable, mounted in a convenient position on the rear side of the driver's cab.
- h) *Inspection lamp* — protected type, on wander lead with plug. A socket shall be provided on the control panel in the driver's cab for plugging in the lamp.
- j) *Tools* — all tools required for routine maintenance of the appliance which are not included in the standard kit of tools for the chassis.
- k) *Windscreen wipers* — two, electrically operated.

6.3 Equipment — The appliance shall be provided with the equipment detailed in Appendix A.

7. MARKING

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

- a) Manufacturer's name or trade-mark, and
- b) Year of manufacture.

A P P E N D I X A

(*Clauses 4.3.1 and 6.3*)

SCHEDULE OF EQUIPMENT TO BE CARRIED ON THE APPLIANCE

<i>Item No.</i>	<i>Equipment</i>	<i>Quantity</i>
1.	Fireman's axes (<i>see</i> IS : 926-1970*)	2
2.	Axe, large (<i>see</i> IS : 5505-1969†)	1
3.	Axe, hand (<i>see</i> IS : 5505-1969†)	1
4.	Shovel [<i>see</i> IS : 274 (Parts 1 and 2)-1981‡]	1
5.	Spare expellent gas cylinders, each of 50 litres capacity, filled with gas	4

*Specification for firemen's axe (*first revision*).

†Specification for multi-edged rescue axe (*non-wedging*).

‡Specification for shovels (*third revision*).

(Continued from page 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1 \text{ N} = 1 \text{ kg.m/s}^2$
Energy	joule	J	$1 \text{ J} = 1 \text{ N.m}$
Power	watt	W	$1 \text{ W} = 1 \text{ J/s}$
Flux	weber	Wb	$1 \text{ Wb} = 1 \text{ V.s}$
Flux density	tesla	T	$1 \text{ T} = 1 \text{ Wb/m}^2$
Frequency	hertz	Hz	$1 \text{ Hz} = 1 \text{ c/s (s}^{-1}\text{)}$
Electric conductance	siemens	S	$1 \text{ S} = 1 \text{ A/V}$
Electromotive force	volt	V	$1 \text{ V} = 1 \text{ W/A}$
Pressure, stress	pascal	Pa	$1 \text{ Pa} = 1 \text{ N/m}^2$



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