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IS 944 (1979): Functional Requirements of 1800-1/Min
Trailer Pump 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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Indian Standard
FUNCTIONAL REQUIREMENTS OF 1800-l/min
TRAILER PUMP FOR FIRE BRIGADE USE
(*Second Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

FUNCTIONAL REQUIREMENTS OF 1 800-l/min TRAILER PUMP FOR FIRE BRIGADE USE

(*Second Revision*)

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AMENDMENT NO. 1 DECEMBER 1983

TO

IS:944-1979 FUNCTIONAL REQUIREMENTS OF 1800-1/min
TRAILER PUMP FOR FIRE BRIGADE USE

(Second Revision)

Alterations

(Page 4, clause 4.1, line 2) - Substitute 'IS:1601-1960' for 'IS:1603-1960'.

(Page 4, foot-note with 'V' mark) - Substitute the following for the existing foot-note:

'Specification for performance of constant speed internal combustion engines for automotive purposes.'

(Page 5, clause 4.1, line 1) - Substitute 'at least 5 percent' for 'sufficient'.

(Page 5, clause 4.1.2, line 1) - Substitute the following for the existing line:

'In case of water cooled engine indirect cooling system of the open-circuit type in which water is'.

(Page 6, clause 4.3.2) - Substitute the following for the existing clause:

'4.3.2 The 'impeller shall be dynamically balanced for maximum operating speed along with any other unmachined rotating parts on proper balancing equipment. The pump casing shall be of robust construction and tested to withstand 1.5 times the shut off pressure at maximum operating speed or twice the operating pressure, whichever is higher.'

(Page 6, clause 4.3.3, line 2) - Substitute '27 \pm 2°C' for '16.5°C'.

[Page 6, clause 4.3.3(c), lines 2 and 3] - Substitute the following for the existing lines:

'However, deduction at the rate of 1 percent of every 5 percent change in humidity shall be made when humidity changes from 75 to 95 percent.'

(Page 6, clause 4.3.5, lines 1 and 2) - Delete the following words:

'(with engine cover closed)'.

(Page 7, clause 4.4, line 3) - Substitute the following for the existing line:

'not more than 24 seconds from the time it is engaged after 24 seconds and shall preferably the fully automat

(Page 7, clause 4.5, line 2) - Substitute the following for the existing line:

'compast as possible and preferably a clutch flexible couplings or any other suitable measure shall be incorporated between'.

(HDC 22)

Indian Standard

FUNCTIONAL REQUIREMENTS OF 1 800-l/min TRAILER PUMP FOR FIRE BRIGADE USE (*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 10 August 1979, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 This standard was first published in 1959 and was revised in 1966. The second revision has been prepared incorporating all the amendments issued so far including the one deleting the provisions relating to electrically or manually operated fuel pumps. In this revision provisions have also been made regarding overall dimensions of the unit, choice of materials for different components.

0.2.1 A list of equipment which is not part of this appliance, most of which normally required to assist in operations of this appliance is given at Appendix A for information and guidance.

0.3 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 : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the requirements regarding material, design and construction, workmanship and finish, and performance tests of 1 800-l/min trailer pump for fire brigade use.

2. GENERAL REQUIREMENTS

2.1 The trailer pump shall consist of a pump of capacity of not less than 1 800-l/min at 0.7 MN/m^2 (7.0 kgf/cm^2) pressure, driven by an internal

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

combustion engine. The combined unit being permanently mounted on a trailer with the pump at the rear, and shall be capable of being towed to safety by a standard vehicle.

2.2 Overall Dimensions — The overall length of the whole unit shall not exceed 3·3 m, the height shall not exceed 1·6 m (with spot light) and the wheel track shall not exceed 1·4 m.

3. MATERIAL

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

3.1.1 All the parts which form water-ways or come in contact with water, shall be of corrosion-resisting material or be treated for corrosion resistance. All metal parts exposed to atmosphere shall either be of corrosion-resisting material or treated in an approved manner to prevent corrosion. The following choice of materials shall be followed:

- | | |
|---|--|
| a) Trailer chassis frame | Suitable mild steel sections so as to fulfil requirements given in 4.10 and 6.3 |
| b) Axle | Carbon steel or mild steel so as to fulfil requirements given in 4.7.3 |
| c) Pump casing | Aluminium alloy Grade 4600 A of IS : 617-1975* or leaded tin bronze (Grade II of IS : 318-1962†) |
| d) Impeller ring and impeller neck ring | Leaded tin bronze (Grade II of IS : 318-1962†) |
| e) Pump shaft | Stainless steel Grade O4Cr18Ni10 of IS : 6603-1972‡ |
| f) Engine cover and pump panel | Mild steel sheets (IS : 513-1973§ ordinary grade) |

4. DESIGN AND CONSTRUCTION

4.1 Engine — The IC engine shall have not less than 4 cylinders and shall conform to IS : 1603-1960||. The brake horse power developed shall

*Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*).

†Specification for leaded tin bronze ingots and castings (*revised*).

‡Specification for stainless steel bars and flats.

§Specification for cold rolled carbon steel sheets (*second revision*).

||Specification for performance of variable speed internal-combustion engines for automatic purposes.

be at maximum working load. Engine shall have sufficient power to work the pump at its rated output at 0.7 MN/m^2 (7 kgf/cm^2) pressure and shall have sufficient reserve power. The engine if of petrol type shall have dual coil ignition with automatic cut out. The engine shall also be provided with a generator/alternator for charging 12-volt battery with a capacity of 92 Ah at 10 hour rate.

4.1.1 In case of petrol engine, in addition to battery starting system a well designed and permanently attached type hand starting device shall be fitted so as to be easily accessible with means to ensure reliable and quick starting of the engine. In case of diesel engine preferably hand cranking arrangement shall be provided.

4.1.2 Indirect cooling system of the open-circuit type in which water is discharged to waste shall be provided so that engine temperature is maintained in range of temperature recommended by engine manufacturers. This shall consist of header tank incorporating copper coils. Water for cooling in the tank shall be fed from the main centrifugal pump and after having circulated through the coils shall go to waste which shall not exceed 30 l/min. Drain plug shall be provided. Filter capable of being cleaned readily when the pump is in operation shall also be provided.

4.1.3 Lubricating system shall be provided with an accessible external filter and means to gauge with reasonable accuracy during running, the level of the oil in the sump, preferably by a tubed dip-stick. The oil filter shall be so arranged as to permit oil to be replenished while the unit is running.

4.1.4 The engine exhaust shall be arranged so as to discharge, as far as possible, away from the pump-operating position.

4.1.5 The engine fuel tank and water tank shall be protected by a suitably designed cover so arranged as to give easy access to the engine for operational purposes without removing the whole cover. The engine cover should be louvered so as to permit adequate air circulation. The battery shall be easily removable and shall have covers and held properly so that it is not displaced during towing.

4.2 Fuel System

4.2.1 A fuel tank of adequate capacity for a minimum continuous run of 2 hours without refuelling and a graduated dip-stick should be provided.

4.2.2 The filling orifice of ample size shall be positioned away from the exhaust pipe and shall be accessible without removing the engine covers.

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The cap shall be clearly marked with type of fuel and shall incorporate an anti-flash device.

4.2.3 There shall be one fuel pump which shall be mechanically operated. It shall be preferably provided with a drain plug.

4.3 Pump

4.3.1 The pump shall be of the centrifugal type and so designed as to afford easy access to the impeller. It could be single or double stage but its characteristics should match with the engine ratings for continuous running. Glands of suitable type shall also be provided. A drain plug shall be provided at the bottom of the casing.

4.3.2 The impeller shall be dynamically balanced. The pump shall show no leakage when subjected to a hydraulic pressure of 2.5 MN/m^2 (25 kgf/cm^2).

4.3.3 The pump shall be tested for its performance duties given in **4.3.4** and **4.3.5** at water temperature of 16.5°C and at a pressure of 760 mmHg. The following allowances (deductions) shall be made:

Allowance for Output :

- a) 1 percent for every 2.5°C rise in water temperature,
- b) 4 percent for every 300 m elevations above mean sea level,
- c) No allowance shall be made for humidity up to 75 percent. However, suitable deduction shall be made when the humidity changes from 75 to 95 percent.

Allowance for Lift :

- a) 30 cm for every 300 cm elevation above mean sea level, and
- b) 1 percent for 2.5°C rise in water temperature.

4.3.4 The pump when tested in conditions mentioned in **4.3.3** shall be capable of giving requirements given in Table 1 when running at not more than 4 000 rev/min of impeller-shaft and working with all internal and external strainers (except basket strainer) fitted.

4.3.5 The pump shall run continuously for a period of 4 hours (with engine cover closed) delivering rated output at 3 m lift and at 0.7 MN/m^2 (7 kgf/m^2) pressure. During this test the water in the engine cooling system shall not be replaced and the temperature of engine lubricating oil shall not exceed the specified value.

**TABLE 1 PERFORMANCE DUTIES OF TRAILER FIRE FIGHTING
LARGE PUMP 1 800-1/min**

(Clause 4.3.4)

OUTPUT	PRESSURE	LIFT (MEASURED VERTICALLY FROM WATER LEVEL TO SUCTION EYE)	CONDITIONS
(1)	(2)	(3)	(4)
l/min	MN/m ² (kgf/cm ²)	m	—
1 800	0.7(7.0)	3.0	Working through 5 m, that is two 2.5-m lengths of specified suction hoses
1 450	0.88(8.8)	3.0	
720	0.7(7.0)	7.0	Working through 10 m that is, four 2.5-m lengths of specified suction hoses

4.3.6 The male round thread suction eye shall be provided with a standard 100-mm suction connection (*see* IS : 902-1974*) with internal strainer and blank cap. The strainer shall be readily removable, but shall be retained firmly in position when in use. There shall be two delivery valves (*see* IS : 4928-1968†) with 63-mm female instantaneous hose connection, and blank caps. Blank cap shall incorporate means for relieving pressure between the valve and the cap.

4.4 The primer shall be capable of lifting water at least 7.0 m (measured vertically from water level to the centre of suction eye of the pump) in not more than 24 seconds and shall preferably be fully automatic.

4.5 Transmission — The assembly of the pump and engine shall be as compact as possible and preferably a clutch shall be incorporated between the pump and the engine. The engine and pump should be mounted on antivibration mountings so as to reduce vibration to minimum.

4.6 Control and Instruments — The illuminated pump panel provided adjacent to the suction eye and delivery valve, shall include the following:

- a) Ignition switch;
- b) Throttle control;
- c) Ammeter;
- d) Choke for petrol engine;

*Specification for suction hose couplings for fire fighting purposes (*second revision*).

†Specification for quick closing clack-valve for centrifugal pump outlet.

e) Gauges:

1) Compound gauge calibrated as follows:

Vacuum — 0 to 75 cmHg

Pressure — 0 to 0.5 MN/m² (0 to 5 kgf/cm²)

**2) Pressure gauge calibrated from 0 to 1.6 MN/m²
(0 to 6 kgf/cm²);**

f) Temperature gauge;

g) Oil pressure gauge;

h) Pump and pump panel light;

j) Primer control (if primer is not fully automatic);

k) Spot light adjustable switch; and

m) Fuel contents gauge.

4.7 Trailer

4.7.1 The trailer frame shall incorporate two semi-elliptic springs (*see* IS : 1135-1973*) and axles. Cross-country type pneumatic tyres of 6.00 × 16 size, 6 ply shall be used for the unit. The whole unit shall be compact and the pumping unit shall be so mounted as to bring centre of gravity as low as possible.

4.7.2 The centre of gravity of the whole unit shall be slightly forward of the wheel axle when the towing eye is 66 cm above the ground level. The trailer shall not tilt backward when resting on front leg. No part of the trailer shall have a clearance less than 23 cm when the trailer is tilted so as to raise the height of the eye 65 cm or to lower it to 45 cm. In towing position the height of the towing eye shall normally be 55 cm above ground level.

4.7.3 When the fully laden trailer is being towed at 20 km/h in cross country for 2 km and in normal traffic conditions on tar road for 10 km, the trailer shall hold the road well. The axle shall not distort and the alignment of the wheels is ensured.

4.7.4 Efficient brakes shall be provided on the two wheels, operated through compensating gear by over-run. A hand lever situated in an accessible position at the front of the trailer frame shall be provided for operating the brake when the trailer is disconnected from the towing vehicle. The 'OFF' position of the trailer frame shall be towards the front of trailer and there shall be ratchet or similar device to hold the brake in the 'ON' position.

*Specification for leaf springs for automobile suspension (*second revision*).

4.7.5 Two handles (man-handling bars) of mild steel, each not less than 50 cm long and which can be folded and secured along the frame when not in use, shall be provided at the front of the trailer frame. These handles shall be at least 15 cm above the level of the towing eye.

4.7.6 Two eyes for the attachment of drag ropes shall be provided in suitable positions. Four slinging eyes shall be provided two of which may be drag eyes.

4.7.7 Two jack legs in the rear and one in the front capable of being lowered into position and adequately secured to provide a suitable base for the unit, when pumping or standing unattached, shall be provided. The legs shall have 200 mm round mild steel plates, dished upwards, welded to the base of the pipe legs to prevent penetration into the earth when standing unattached. The legs shall be capable of being positively locked in the 'housed' position.

4.7.8 Provision shall be made on the trailer for carrying equipment detailed in Appendix B.

4.8 Stability — The stability of the whole unit shall be such that under equipped conditions and with the front supported to produce the normal towing position, if the surface on which the appliance stand is tilted to either side to an angle of 25 degrees from the horizontal, the point at which the overturning occurs is not passed.

4.9 Towing Eye and Draw Bar

4.9.1 The towing eye and draw bar shall be of substantial construction. The towing eye shall have an internal diameter of 75 mm and shall be of high quality forged steel of not less than 63 MN/m^2 ($63 \times 10^3 \text{ kgf/cm}^2$) ultimate tensile stress or other suitable material capable of giving suitable performance. The shank shall be adequately machined with adequate radius at the shoulders.

4.9.2 To ensure that the housing will withstand shock loads inherent under towing conditions, it is essential that the design of the eye and housing, and the means of fixing the housing the trailer chassis frame will take care of a draw pull of 11 kN (1 100 kg) without being overstressed.

4.9.3 The shank of the towing eye shall be mounted in the housing so as to absorb shocks in both directions of movement; for forward to cushion, the shock of taking the tow load, and backward to regulate the rate of application of brakes. The compensation mechanism shall be such as to give a smooth tow at all reasonable speeds on average road surface.

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4.10 Mass — The mass of the complete unit shall not exceed 1 150 kg including water, fuel and oil but without equipments as mentioned in Appendix A and Appendix B.

5. WORKMANSHIP AND FINISH

5.1 All parts of the appliance shall have good workmanship.

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

6. INSTRUCTION BOOK, ACCESSORIES AND EQUIPMENT

6.1 Instruction book or books including both operating and normal maintenance procedures shall be supplied for the guidance of the user. The book or books shall include an itemized and illustrated spare parts list giving reference numbers of all the parts.

6.2 Accessories — The following accessories shall be provided:

- a) *Electric Taillight with Number Plate* — the electric cable from this light shall terminate in a plug at the front of the trailer.
- b) *Tools* — A kit of all essential tools required for normal maintenance of the appliance.
- c) *Headlight* — Headlight of not more than 150 mm diameter on the trailer pump.

6.3 Equipment — The list of the equipment to be provided in the trailer is given in Appendix B.

7. MARKING

7.1 The trailer pump shall be clearly and permanently marked with the following information:

- a) Manufacturer's name and trade-mark;
- b) The output capacity of the pump in l/min; and
- c) Year of manufacture.

*Specification for colours for ready mixed paints (*second revision*).

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

APPENDIX A

(*Clauses 0.2.1 and 4.10*)

LIST OF EQUIPMENT RECOMMENDED FOR USE WITH THE APPLIANCE

SL No.	EQUIPMENT	QUANTITY
1.	63 mm unlined delivery hose (<i>see</i> IS : 4927-1970*) or controlled percolating hose (<i>see</i> IS : 8423-1977†) 30 m length with male and female couplings (<i>see</i> IS : 903-1975‡)	10 No.
2.	Aluminium extension ladder, 7.5 m (<i>see</i> IS : 4571-1977§)	1 No.
3.	63 mm rubber lined delivery hose (<i>see</i> type II of IS : 636-1979) 30 m length with male and female couplings (<i>see</i> IS : 903-1975‡)	10 No.
4.	Hose bandages [<i>see</i> IS : 5612(Part II)-1977¶]	6 No.
5.	Double female couplings 63 mm (<i>see</i> IS : 901-1975**)	2 No.
6.	Rubber washers for 63 mm couplings (<i>see</i> IS : 937-1965††)	40 No.
7.	Dividing breaching, with control, 63 mm instantaneous (<i>see</i> IS : 5131-1969‡‡)	1 No.
8.	Collecting breaching, 63 mm instantaneous (<i>see</i> IS : 905-1965§§)	1 No.
9.	Hydrant stand pipe, double outlet (<i>see</i> IS : 5714-1970)	1 No.

*Specification for unlined flax canvas hose for fire fighting.

†Specification for controlled percolating hose for fire fighting.

‡Specification for fire hose delivery couplings, branch pipe, nozzles and nozzle spanner (*second revision*).

§Specification for aluminium extension ladders for fire brigade use (*first revision*).

||Specification for fire fighting hose (rubber lined or rubberised fabric lined woven jacketed) (*second revision*).

¶Specification for hose-clamps and hose-bandages for fire brigade use: Part II Hose bandages (*first revision*).

**Specification for couplings, double male and double female, instantaneous pattern for fire fighting (*second revision*).

††Specification for washers for water fittings for fire fighting purposes (*revised*).

‡‡Specification for dividing breaching, with control, for fire brigade use.

§§Specification for delivery breaching, dividing and collecting instantaneous pattern for fire fighting purposes (*revised*).

|||Specification for hydrant, stand-pipe for fire-fighting.

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SL No.	EQUIPMENT	QUANTITY
10.	Branch with revolving head (with branch pipe) for 63 mm size instantaneous hose couplings (<i>see</i> IS : 906-1972*)	1 No.
11.	Branch pipes for 63 mm size instantaneous hose couplings (<i>see</i> IS : 903-1975†)	1 No.
12.	Nozzles (<i>see</i> IS : 903-1975†)	2 No.
	a) 6 mm	2 No.
	b) 12 mm	2 No.
	c) 20 mm	2 No.
	d) 25 mm	2 No.
13.	Torch flash light, 3 cells (<i>see</i> IS : 2083-1962‡)	2 No.
14.	Fire extinguisher, dry powder type 2 kg (<i>see</i> IS : 2171-1976§)	1 No.
15.	Fire extinguisher, carbon-dioxide type, 2 kg capacity (<i>see</i> IS : 2878-1973)	1 No.
16.	First aid box for 10 persons	1 Set
17.	Rubber gloves (<i>see</i> IS : 4770-1968¶)	1 pair
18.	Fireman's axe, large (<i>see</i> IS : 926-1970**)	1 No.
19.	Shovels [<i>see</i> IS : 274 (Parts I and II)-1966††]	2 No.
20.	Pick axe, 1 kg weight (<i>see</i> IS : 273-1973‡‡)	1 No.

*Specification for branch with revolving head for fire fighting purposes (*second revision*).

†Specification for fire hose delivery couplings, branch pipe, nozzles and nozzle spanner (*second revision*).

‡Specification for flashlight.

§Specification for portable fire extinguishers, dry powder type (*second revision*).

||Specification for portable fire extinguishers, carbon-dioxide type (*first revision*).

¶Specification for rubber gloves for electrical purposes.

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

††Specification for shovels:

Part I General purposes shovels.

Part II Heat-treated shovels (*second revision*).

‡‡Specification for picks and beaters (*second revision*).

SL No.	EQUIPMENT	QUANTITY
21.	Crow bar with chisel and claws 1 m length (see IS : 704-1968*)	1 Set
22.	Hand rip saw 65 mm (see IS : 5098-1969†)	1 No.
23.	Spanner, adjustable, 30 cm (see IS : 6149-1971‡)	1 No.
24.	Fire hook (see IS : 927-1964§)	1 No.
25.	Asbestos gauntlets, 40 cm	2 No.
26.	Foam compound for producing mechanical foam 20 litres drum (see IS : 4989-1974)	2 No.
27.	Foam making branch pipe FB5 (see IS : 2097-1969¶)	1 No.
28.	Head collecting three ways 100 mm (see IS : 904-1965**)	1 No.
29.	Branch pipe universal (see IS : 2871-1964††)	1 No.
30.	Key hydrant (see IS : 910-1972‡‡)	1 No.
31.	Rope manila-30 m	1 No.
32.	Hose clamp [see IS : 5612 (Part I)-1977§§]	1 No.
33.	Shears or bolt clippers 60 cm (see IS : 5200-1969)	1 pair
34.	Jack screw, lifting 4 tonnes	1 No.
35.	Hand tool bag (leather)	1 No.
36.	Grease gun	1 No.
37.	Oil can (2 litres)	1 No.
38.	Petrol can (9 litres)	1 No.
39.	Oil filling funnel	1 No.
40.	Petrol filling funnel	1 No.
41.	Sledge hammer 6.5 kg	1 No.

*Specification for crow-bars and clawbars (*first revision*).

†Specification for cross-cut and rip saws.

‡Specification for single ended open-jaw adjustable wrenches.

§Specification for fire hooks (*revised*).

||Specification for foam compound for producing mechanical foam for fire fighting (*first revision*).

¶Specification for foam-making branches.

**Specification for 2-way and 3-way suction collecting heads for fire fighting purposes (*revised*).

††Specification for branch pipe, universal, for fire fighting purposes.

‡‡Specification for combined key for hydrant, hydrant cover and lower valve (*first revision*).

§§Specification for hose-clamps and hose-bandages for fire brigade use: Part I Hose clamps.

|||Specification for bolt clippers.

APPENDIX B

(*Clauses 4.7.8, 4.10 and 6.3*)

EQUIPMENT TO BE PROVIDED IN TRAILER PUMP

Sl No.	EQUIPMENT	QUANTITY
1.	100-mm suction hose (<i>see</i> IS : 2410-1963*) in 4.5 lengths with 100-mm suction hose coupling (<i>see</i> IS : 902-1974†)	2 No.
2.	Suction wrenches for 100-mm suction hose couplings (<i>see</i> IS : 4643-1968‡)	2 No.
3.	Suction strainer for 100-mm suction hose (<i>see</i> IS : 907-1965§)	1 No.
4.	63-mm delivery hose (<i>see</i> IS : 4927-1968) in 30 m length with instantaneous couplings (<i>see</i> IS : 903-1975¶)	4 No.
5.	Rope, manila — 15 m (<i>see</i> IS : 1084-1969**)	1 No.
6.	Suction adopters 100-mm female to 63-mm instantaneous male	1 No.
7.	Branch pipes 63 mm (<i>see</i> IS : 903-1975¶)	2 No.

*Specification for suction hose of rubber for fire services.

†Specification for suction hose couplings for fire fighting purposes (*second revision*).

‡Specification for suction wrenches for fire brigade use.

§Specification for suction strainers, cylindrical and shoe types, for fire fighting purposes (*revised*).

||Specification for unlined flax canvas hose for fire fighting.

¶Specification for fire hose delivery couplings, branch pipe, nozzles and nozzle spanner (*second revision*).

**Specification for manila ropes (*second revision*).

(Continued from page 2)

Fire Fighting Units Subcommittee, BDC 22 : 3

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