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Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF INTERNAL FIRE HYDRANTS AND HOSE REELS ON PREMISES

(First Revision)

भारतीय मानक

परिसर में भीतरी अग्नि हाइड्रेंट और होज़ रीलों के संस्थापन और रखरखाव की रीति संहिता

(पहला पुनरीक्षण)

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 20 February 1989, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

The main intentions of provision of first-aid and in-built fire fighting arrangements are to extinguish fire at its inception or to control its spread, to assist the fire services in dealing with the fire and in reducing the losses suffered as a result of fire. Such arrangements are, therefore, supplementary to structural fire safety provisions laid down in relevant Indian Standards. The first-aid fire fighting arrangements cover provision of portable fire extinguishers and first-aid hose reel installation with internal fire hydrants. The selection, installation and maintenance of fire extinguishers are covered in IS 2190 : 1979 'Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers (*second revision*)'. This standard covers requirements in respect of installation and maintenance of internal fire hydrants and hose reel systems with or without sprinkler installation for different types of buildings. Internal fire hydrants are intended for use by fire brigade or other trained personnel and provide means of delivering considerable quantities of water to extinguish or to prevent the spread of fire. Hose reels delivering smaller quantities of water can be operated even by untrained persons and can be more rapidly brought into action in the early stages of fire. This system is more effective when the premises is provided with an early warning device of any outbreak of fire.

This standard covering wet- and dry-riser system was first published in 1966. The revision cover generally only wet-riser system and the provisions given are in line with the ones followed in advanced countries. The revision also covers the details of water tanks, fire pumps and other components as well as maintenance of system.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF INTERNAL FIRE HYDRANTS AND HOSE REELS ON PREMISES

(First Revision)

1 SCOPE

1.1 This standard lays down the requirements of installation and maintenance of internal fire hydrants and hose reels on the premises.

NOTE — The requirements in regard to the installation and maintenance of external fire hydrants are covered in separate Indian Standard.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Static Water Tank

Underground or surface water tank, constructed to store water for fire fighting purpose.

3.2 Terrace Tank

A concrete/masonry/plastic steel tank constructed or erected on terrace of building for fire fighting purpose.

3.3 Priming Tank

A small tank erected in/over the pump house above the fire fighting pumps to keep the pump casing and suction of the fire pump permanently flooded.

3.4 Foot Valve

A valve fixed in the suction strainer of the fire pump which opens only inwards to allow in-rush of water into the pump suction and fire pump when the fire pump is actuated automatically/ manually.

3.5 Jockey Pump

A pump of small capacity which is set to come into operation, automatically with drop in static pressure in the system and to automatically stop when the pre-set pressure is reached again.

3.6 Terrace Pump

An electrically driven pump, located on the terrace connected to a terrace tank with gate valve on suction side and to the internal hydrant system with non-return valve on delivery side.

3.7 Fire Pump

An electric/diesel pump installed at static water tank to charge the wet-riser systems.

3.8 Stand-by Pump

A pump of same capacity as fire pump, driven by a diesel engine or connected to any other alternate source of electric supply.

3.9 Pump Panel

Panel comprising starting, stopping and indicating devices of fire pumps.

3.10 Dry-Riser

An arrangement of fire fighting within the building by means of vertical rising mains not less than 100 mm internal dia with landing valves on each floor/landing which is normally dry but is capable of being charged with water usually by pumping from fire service appliances.

3.11 Down-Comer

An arrangement for fire fighting within the building by means of down-comer mains of not less than 100 mm internal dia, connected to terrace tank through terrace pump, gate valve and non-return valve and landing valves on each floor/landing. It is also fitted with inlet connections at ground

level and air release valve at roof level for being capable of charged with water by pumping from fire service appliances.

3.12 Wet-Riser-*cum*-Down-Comer

An arrangement for fire fighting within the building by means of vertical rising mains of not less than 100 mm internal dia with landing valves on each floor/landing connected to terrace tank for fire fighting purpose, through a terrace pump, gate valve and non-return valve near the tank and to a fire pump, gate and non-return valves, over the static tank.

3.13 Wet-Riser

An arrangement for fire fighting within the building by means of vertical rising mains of not less than 100 mm internal dia with landing valves on each floor/landing for fire fighting purposes and permanently charged with water from a pressurized supply.

3.14 Landing Valve

An assembly comprising valve(s) and outlet(s) connection from a riser system.

3.15 Hose Reel

Fire fighting equipment, consisting of a length of tubing fitted with a shut-off nozzle and connected to a reel, with a permanent connection to a pressurized water supply.

3.16 Air Release Valve

A device by which the trapped air inside a riser main is expelled by water as the system is being charged.

3.17 Air Vessel

A cylindrical vessel installed in the wet-riser system at the bottom and top levels to counteract the water hammer effects.

3.18 Pressure Switch

A switch connected on delivery line of fire pump, or in the body of hydro-pneumatic tank at pre-set pressure level so designed to automatically start the fire pump or jockey pump, as the case may be, when the pressure in the system falls below the pre-set level.

3.19 Fire Service Inlet

A 2- or 3-way collecting head (*see* **5.1.1** and **5.2.3**) with non-return valves fitted to the down-comer/wet-riser main, so that in case of need, fire service can directly pressurize the system with their pump.

3.20 Fire Service Connections

This is a 4-way collecting breeching with blank caps (without non-return valve) fixed to a 150-mm dia pipe which is connected to the fire tank for filling from external source.

4 INTERNAL HYDRANT INSTALLATION

4.0 An internal hydrant, installation comprise the following elements:

a) Static or terrace tank for storing water for fire fighting purpose;

b) Rise mains, down-comer mains or external mains to feed water from the source to the required point under pressure;

c) Fire fighting pump/pumps with all fitments and components and pump control panel, housed in a pump house; and

d) All necessary components like internal hydrants (landing valves) and external hydrants, hose reels, hoses and branch pipes, suitably housed.

4.1 Underground Static Water/Terrace Tanks

4.1.1 *Underground Static Water Tanks*

The capacity should be as given in Table 1. The tank should not be more than 3·5 m deep having a slope (1 : 100) and 1 m deep sump of 1 × 2 m at the lowest end. The side with sump should preferably be at the front and should have an easily removable manhole cover through which fire engine suction hose can be lowered into the sump for direct pumping. Static water tank should be designed and constructed in conjunction with domestic tank wherever feasible.

Underground tanks should be provided with compartments with external interconnection at bottom levels having gate valves at both the ends for periodical maintenance/cleaning purpose.

At least two manholes each of adequate size with cover conforming to IS 1726 (Part 1) : 1974 should be provided on the tanks (outside the pump house) so as to facilitate fire appliances to draw water from tank when necessary.

Access road to the tank where located outside the building should be at least 6 m in width and the same should be designed suitably to bear a load of fire appliances weighing up to 18 tonnes. The access road should be kept free from encroachment and obstructions at all times.

4.1.2 *Terrace Tanks*

These should be mounted on suitable girders and plates for equal distribution of load and should be structurally stable and the capacity should be as given in Table 1.

4.2 Fire Pumps and Pump House

4.2.1 The pump house should be located preferably outside the building with a minimum clearance of 6 m from adjoining buildings. The pump house should have adequate natural ventilation with windows, fitted with expanded metal for protection. If the pump house, houses a diesel pump, the exhaust pipe of the diesel engine should be extended to outside the pump house and exhaust discharged at an appropriate height in the open air. The floor of the pump house should be sloped to the farthest end to drain away any water leaking from glands, valves, etc. The pump house should have normal lighting, and also emergency lighting facility, either from a second source or from the generator. If the pump house is located inside the building, either on floor one or in the basement, it should be separated from the rest portion with a wall having 2 hour fire rating and fire check door at its entrance having 1 hour fire rating. For pump house in basement, forced mechanical ventilation should be provided. Pump house in floor one should be located on periphery of building with access directly from outside/open area.

4.2.2 *Arrangement of Pumps*

The pump house should be of adequate dimension to house all the pumps with suction, delivery pipes, fittings and starter control panel, air vessel, etc, with adequate circulation area. A minimum clearance of 1 m at front and back and 0·75 m on sides and between pumps should be provided for all major pumps exceeding 2 280 l/min capacity. For smaller pumps, including jockey pumps, the clearance required should be 0·75 m at front and back and 0·60 m at sides and between pumps. The head room clearance for all pump houses should be minimum 2·75 m.

The pump control panel which should also be housed in the pump room should of adequate dimension to incorporate : TPN switch and HRC switch both of adequate capacity, selector switch ammeter, voltmeter and phase indicating lights, single phase preventer, start and stop push buttons, auto-manual switch, auxiliary contactors for inter-locking/sequence of operations and all necessary gauges, fittings required to complete the system (the busbar should of copper of appropriate thickness).

Where diesel pump is provided, it should have a separate panel, also located in the same pump room or adjoining separate room. The panel should have its separate battery, with battery charging device, and auto-manual changeover arrangement. It should incorporate an interlocking device with the main pump panel so that both the electric pump and the diesel pump do not operate simultaneously.

Air vessel of adequate capacity should be installed in the pump house, with pressure switches incorporated on the delivery line. There should be two pressure switches — one with upper and lower limit, for Jockey pump, and another only for lower pressure limit for the main pump. Stopping of main pump should be only by manual push button which should be prominently indicated on the pump panel.

Similar lower pressure limit switch should also be incorporated in the diesel pump to make the start automatically at pre-set drop in pressure.

4.2.2.1 *Terrace Pump*

The starting of terrace pump should be automatic with pressure switch incorporated in down-comer side so that with opening of any hydrant valve, or hose reel on any floor, it will start automatically with fall in line pressure. In addition, there should be a manual push button starter in the starter control panel to be located on ground floor (floor one) of building. Stopping of pump should be by a push button located in the same starter control. Both the push buttons should be prominently indicated, and should be in different colour for easy identification.

4.2.3 *Suction and Delivery Pipe Sizes*

The suction and delivery pipes should be of adequate size to meet the functional requirements of the pump, and should not be less than following:

	Suction	*Delivery*
a) 450 l/min terrace pump	50 mm	50 mm
b) 900 l/min „ „	75 mm	50 mm
c) 1 400 l/min „ „	100 mm	100 mm
d) 2 280 l/min fire pump	150 mm	150 mm
e) 2 850 l/min „ „	200 mm	150 mm
f) 4 540 l/min „ „	250 mm	200 mm

Where a manifold is used to make a common suction header, the size of manifold should be at least equal to the cross section of the main pumps (not counting stand-by pump) suction inlets.

4.2.4 Priming of pumps in all cases should preferably be by positive suction. This can be

achieved by having the pump house at lower level than the water tank, so as to have a permanently flooded suction. However, where this is not practicable, priming with the help of a priming tank with a foot valve and strainer arrangement may be used. The capacity of priming tank should be 8 times the total volume of the suction pipe, from pump up to the foot valve.

4.2.5 For wet-riser-*cum*-down-comer system, two pumps of different capacity — one for the wet-riser (for static tank) and the other for down-comer system (for terrace tank) should be installed. The pumps should be fed from normal source of power supply and also by an alternative source in case of failure of normal source of supply.

4.2.6 For a wet-riser system two automatic pumps should be installed to feed the wet-rising main, one of which should act as stand-by, each pump should have different source of power and so arranged that when acting as duty pump, it will operate automatically when one or more hydrant/hose reel is opened thus causing a drop in pressure. The stand-by pump should be arranged to operate automatically in case of failure of the duty pump. There should be an interlocking arrangement between two main pumps so that only one should come into operation at a time.

4.2.7 An arrangement for supply of alternative source of power automatically should be provided to drive pumps, etc, in case of failure of normal power supply. The alternative source should be one of the following:

a) Supply from a diesel generating set of adequate capacity to meet full requirement of fire pump(s) including initial current for direct on line/star-delta starting device over and above the other requirements like automatic fire detection and alarm system, fire lift, staircase and corridor lighting circuits, fire pumps, pressurization system and mechanical exhaust system, etc, with automatic changeover. Fire pump may be connected to diesel engine having same power as that of electric fire pump with automatic changeover in case of power supply failure with interlocking arrangement.

b) A power supply from separate sub-station for operating emergency services mentioned in 4.2.7(a).

4.2.8 *Pump Mounting*

The pumps should be mounted firmly on concrete foundation of minimum 75 mm thickness with vibration absorbing layer. The foundation should be at least equal in length to the common base plate of pump, motor and flexible coupling between pump and motor.

For diesel engines and pumps the foundation should be equivalent to railing length of engine and pump with flexible couplings.

All fire pumps should be horizontal split-casting centrifugal type with C. I. casing, bronze impellar, and stainless steel shaft mounted on heavy duty bearings. All metal parts coming in constant contact with water should be suitably treated with anti-corrosive treatment, unless these are of non-ferrous metal.

5 RISERS

5.0 Internal hydrants form part of any of the following systems:

a) Dry-riser system,

b) Wet-riser system,

c) Wet-riser-*cum*-down-comer system, and

d) Down-comer system.

5.1 Dry-Riser System (for Cold Region)

5.1.1 Dry-riser main system could be installed in buildings under Group A (i, ii, iii, and iv) (*see* IS 1641 : 1988) where the height of building is above 15 m but not exceeding 24 m up to terrace level and where the water supply for fire fighting is immediately available either through the underground water storage tank/tanks or through water mains/town's main in lieu of provision given in Table 1. The rising main should have two-way fire service inlet without non-return valve at ground level, in front of each such block. It should also be provided with an air-releasing valve at the top level and drain valve at the bottom. The inlet should be about 1 m from the ground level, and easily accessible and unobstructed at all times. Single headed landing valves conforming to IS 5290 : 1983 should be provided at all floor landing/staircase enclosures or other suitable easily accessible point.

5.1.2 Dry-riser system does not include hose reel, hose cabinets, fire hose and branch pipes.

5.2 Wet-Riser System

5.2.1 Wet-riser system should be provided in the types of buldings as indicated in Table 1 according to the provision mentioned. The system should consist of a pipe or number of pipes depending on the area and height of the buildings permanently charged with water under pressure with landing valves, hose reel, hose, branch pipe, etc, at every floor level. A provision of pressure

differential switch to start the pump automatically, so that water under pressure is available for operational hydrant, hose reels, etc, as soon as the water is drawn from hydrant landing valves causing drop in pressure. The system also incorporates a stand-by pump to come into operation automatically when the normal power supply source fails.

5.2.2 The distribution of wet-riser installation in the building should be so situated as not to be farther than 30 m from any point in the area covered by the hydrant and at a height of 0·75 m to 1 m from the floor. The rising mains should not be more than 50 m apart in horizontal.

5.2.3 Fire service inlet with gate and non-return valve to charge the riser in the event of failure of the static pump directly from the mobile pump of the fire services should be provided on the wet-riser system. The fire service inlet for 100 mm internal diameter rising main should have collecting head with 2 numbers of 63 mm inlets and for 150 mm rising main, collecting head with 4 numbers of 63 mm inlets should be provided.

5.3 Wet-Riser-*cum*-Down-Comer

5.3.1 A wet-riser-*cum*-down-comer system should be provided in the type of buildings indicated in Table 1 according to the provision mentioned. However, instead, wet-riser system can be provided with suitable modifications in their requirements as given in **4.2.6.**

5.3.2 The position and spacing of wet-riser-*cum*-down-comers should be similar to wet-riser system (*see* **5.2**).

5.4 Down-Comer System

5.4.1 Down-comer system should be provided in type of buildings indicated in Table 1 according to provisions mentioned.

5.4.2 Single headed landing valve, connected to a 100 mm diameter pipe taken from the terrace pump delivery should be provided at each floor/landing. A hose reel conforming to IS 884 : 1985 and directly tapped from the down-comer pipe should also be provided on each floor/landing.

5.5 Fire Service Inlet

5.5.1 The following facilities/arrangements should be applicable to wet-riser systems:

a) A fire service inlet at ground level fitted with a non-return valve should also be provided to the rising main of each zone for charging it by fire service pumps, in case of failure of fire pump. If two rising mains are within a distance of 30 m horizontally a single fire service inlet will be sufficient.

b) The fire service Inlet should be located and arranged on street side of the building preferably near main entrance, prominently marked and without any obstruction so that fire service can connect hose lines without difficulty.

c) The inlet should be located inside a box made of 1·6 mm mild steel plate with openable 4 mm thick glass frontage with locking arrangements. The words 'Fire Service Inlet' should be written in letters at least 75 mm in height and 12 mm in width in fluorescent fire red colour (*see* IS 5 : 1978).

5.6 Internal diameter of rising mains/down-comer mains for various types of building, should be as given in Table 2.

Table 1 Typical Fire Fighting Installations/Requirements

(*Clauses* 4.1.1, 4.1.2, 5.1.1, 5.2.1, 5.3.1, 5.4.1 *and* 7.2)

Sl No.	Type of the Building/ Occupancy	Type of Installation	Requirements			
			Water Supply		Pump Capacity	
			Underground/ Static Tank	Terrace Tank	Near the Underground Static Tank (Fire Pump)	At the Terrace Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)
I	RESIDENTIAL BUILDINGS (A)					
	a) Lodging or Rooming Houses (A-1) Dormitories (A-3)					
	i) Up to 15 m in height	Nil	20 000 l	Nil	Nil	Nil
	(NOTE — No provisions are necessary for lodging and rooming houses with less than 20 persons and dormitories housing less than 20 persons.)					
	ii) Above 15 m in height but not exceeding 24 m	One down-comer per 1 000 m² floor area per floor	50 000 l	10 000 l (20 000 l if basement is sprinklered)	Nil	450 l/min giving a pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
	iii) Above 24 m in height but not exceeding 45 m	Wet-riser-*cum*-down-comer per 1 000 m² floor area per floor	100 000 l	10 000 l (20 000 l in case basement is sprinklered *see* 7.12)	2 280 l/min giving a pressure not less than 300 kPa (3 kgf/cm²) at topmost hydrant	450 l/min giving a pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
	iv) Above 45 m in height but not exceeding 60 m	One wet-riser per 1 000m² floor area per floor. Riser shall be fully charged with adequate pressure at the topmost hydrant and shall be automatic in operation	150 000 l	Nil	i) 2 280/2 820 l/min giving a pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant. The pump provided will be of multi-stage, multi-outlet (preferably) type with suction and delivery sizes not less than 15 cm dia with low level riser upto 10 storeys and high level riser delivery for upper floors	Nil

	ii) Entire building to be sprinklered			ii) A stand-by pump of equal capacity driven by diesel engine or connected to alternate source of power supply from diesel generator set	
v) Above 60 m in height	i) One wet-riser per 1 000 m² floor area, riser shall be fully charged with adequate pressure at the topmost hydrant and shall be automatic in operation	2 00 000	Nil	i) Same as in Item I (a) (iv) (i) above ii) Same as in Item I (a) (iv) (ii) above	Nil
	ii) Entire building to be sprinklered				
(NOTE — Building with height exceeding 24 m with shopping area exceeding 750 m², the shopping area to be sprinklered.)					
b) One or Two Family Private Dwellings (A-2) Appartment Houses (A-4)					
i) Up to 15 m in height	Nil	Nil	Nil	Nil	Nil
(NOTE — Buildings of A-2 occupancy above 15 m height not to be permitted.)					
ii) Above 15 m but not exceeding 24 m	One down-comer per 1 000 m² floor area per floor	50 000 l	20 000 l	Nil	450 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
iii) Above 24 m but not exceeding 45 m in height (shopping area not exceeding 250 m²)	One wet-riser-*cum*-down-comer per 1 000 m² floor area per floor	50 000 l	20 000 l	1 620 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	450 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
iv) Above 24 m but not exceeding 45 m in height (shopping area above 250 m² but not exceeding 750 m²)	One wet-riser-*cum*-down-comer per 1 000 m² floor area per floor	100 000 l	20 000 l	i) 2 280 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) If the basement car parking area does not exceed 750 m², same wet-riser-*cum*-down-comer pump to feed sprinkler system (*see* 7.12)	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant

Table 1 (*Continued*)

Sl No.	Type of the Building/ Occupancy	Type of Installation	Requirements			
			Water Supply		Pump Capacity	
			Underground/ Static Tank	Terrace Tank	Near the Underground Static Tank (Fire Pump)	At the Terrace Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	v) Above 24 m but not exceeding 45 m in height shopping area exceeding 750 m² but below 1 000 m²	One wet-riser per 1 000 m² floor area (shopping area to be sprinklered)	100 000 l	20 000 l	i) Same as in item I (a) (iv) (i) above ii) Same as in item I (a) (iv) (ii) above	Nil
	vi) Above 45 m in height but not exceeding 60 m (without shopping/with shopping not exceeding 250 m²)	One wet-riser per 1 000 m² floor area per floor	150 000 l	Nil	i) Same as in item I (a) (iv) (i) above ii) Same as in item I (a) (iv) (ii) above	Nil
	vii) Above 45 m in height but not exceeding 60 m with shopping area above 250 m² but not exceeding 750 m²	Same as in item I (a) (v) above	150 000 l	Nil	i) Same as in item I (a) (iv) (i) above ii) Same as in item I (a) (iv) (ii) above	Nil
	viii) Above 45 m in height but not exceeding 60 m with shopping area exceeding 750 m²	One wet-riser per 1 000 m² floor area per floor; (shopping area to be sprinklered)	150 000 l	25 000 l	i) 2 820 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Same as in item I (a) (iv) (ii) above iii) If the basement car parking area does not exceed 750 m², same wet-riser-*cum*-down-comer pump to feed sprinkler system	Nil
	(NOTE — Buildings above 60 m in height not to be permitted.)					
	c) Hotels (A-5)					
	i) Up to 15 m in height with total floor area exceeding 300 m² but not more than 1 000 m²	One wet-riser-*cum*-down-comer per 1 000 m² of floor area per floor	50 000 l	20 000 l	1 620 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the top most hydrant
	(NOTE — Hotel, with total floor area not exceeding 300 m², to be exempted from provisions of this requirement.)					

ii) Up to 15 m in height with total floor area exceeding 1 000 m²	One wet-riser for 750 m² of floor area per floor. Wet-riser to be fully charged with adequate pressure and automatic in operation	100 000 l	20 000 l (if sprinklered provided)	2 280 l/min (2 820 l/min if sprinklered) with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	Nil
iii) Above 15 m but not exceeding 24 m	One wet-riser for 750 m² floor area per floor	150 000 l + 50 000 l for sprinkler for shopping area and if basement used for car park	20 000 l (if sprinklered)	i) 2 280 l/min (2 820 l/min if sprinklered) with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Same as in Item I (a) (iv) (ii) above	Nil
iv) Above 24 m but not exceeding 45 m	do	200 000 l + 50 000 l extra requirement for sprinkler for shopping area and if basement used for car park	do	i) Same as in Item I (c) (iii) (i) above ii) Same as in Item I (c) (iii) (ii) above	Nil
v) Above 45 m	do	do	do	i) 2 820 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Pump of multi-stage type or alternatively break pressure wet-riser system by interposing suction tanks and pumps at every 15 floor level iii) Stand-by pump of equal capacity on alternate source of supply iv) All the floors to be sprinklered, with independent pump	Nil

Table 1 (*Continued*)

Sl No.	Type of the Building/ Occupancy	Type of Installation	Requirements			
			Water Supply		Pump Capacity	
			Underground/ Static Tank	Terrace Tank	Near the Underground Static Tank (Fire Pump)	At the Terrace Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)
II	EDUCATIONAL (B) AND INSTITUTIONAL (C) BUILDINGS					
	a) Buildings other than Hospitals and Nursing Homes					
	i) Up to 15 m in height	Nil	50 000 l	Nil	Nil	Nil
	(NOTE — Buildings not exceeding 3 storeys and area not exceeding 1 000 m² are exempted.)					
	ii) Above 15 m in height but not exceeding 24 m height	One wet-riser-*cum*-down comer per 1 000 m² floor area per floor/block	50 000 l	20 000 l	1 620 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	450 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
	iii) Above 24 m in height but not exceeding 35 m	One wet-riser per 1 000 m² floor area per floor/block	100 000 l	20 000 l (if sprinklers are provided in basement)	i) 2 280 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Sprinkler for basement (*see* 7.12)	
	(NOTE — Buildings above 35 m in height not to be permitted.)					
	b) Hospitals and Nursing Homes					
	i) Up to 15 m in height	One down-comer per 1 000 m² floor area per floor	50 000 l	20 000 l	Nil	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
	(NOTE — Ground floor with beds not exceeding 100 and ground and two upper floors not exceeding 50 beds are exempted.)					
	ii) Above 15 m in height but not exceeding 24 m	One wet-riser-*cum*-down-comer for 1 000 m² floor area per floor	200 000 l+50 000 l if basement is sprinklered	20 000 l	i) 2 280 l/min (2 820 l/min if sprinklered) with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant 2 820 l/min if basement is sprinklered (*see* 7.12)	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant

iii) Above 24 m in height but not exceeding 35 m	One wet-riser 1 000 m² floor area per floor	200 000 l + 50 000 l (if partially sprinklered *see* 7.12)	25 000 l (if partially sprinklered *see* 7.12)	2 820 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	Nil

(NOTE — Buildings above 35 m in height not to be permitted.)

III ASSEMBLY BUILDINGS (D)

i) Up to 15 m in height	One wet-riser-*cum*-down-comer per 500 m² floor area per floor	50 000 l	20 000 l (25 000 l if partially sprinklered *see* 7.12)	i) 2 280 l/min (2 820 l/min if sprinklered) with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Stand-by pump as alternate source of power supply	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
ii) Above 15 m in height but not exceeding 24 m	do	100 000 l	do	i) Same as in item III (i) (i) above ii) Same as in item III (i) (ii) above	do
iii) Above 24 m in height but not exceeding 35 m	One wet-riser per 500 m² floor area per floor. Riser shall be fully charged with adequate pressure at the topmost hydrant and shall be automatic in operation	150 000 l + 5 000 l if sprinklered (*see* 7.12)	Nil	i) Same as in item III (i) (i) above ii) Same as in item III (i) (ii) above	Nil

(NOTE — Buildings above 35 m in height not to be permitted.)

IV BUSINESS (E) AND MERCANTILE (F) BUILDINGS

i) Up to 15 m in height	One down-comer per 500 m² floor area per floor	50 000 l	20 000 l	Nil	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant

(NOTE — Buildings with ground and up to two floors with total area not exceeding 2 500 m² is exempted from above provision.)

ii) Above 15 m in height but not exceeding 24 m	One wet-riser-*cum*-down-comer per 500 m² floor area per floor. Riser shall be fully charged	150 000 l + 5 000 l for basement if sprinklered (*see* 7.12)	20 000 l (25 000 l if partially sprinklered *see* 7.12)	i) 2 280 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	do

(NOTE — In case of reliable town hydrants system the capacity of water tank could be reduced to two thirds.)

Table 1 (*Concluded*)

Sl No.	Type of the Building/ Occupancy	Type of Installation	Requirements			
			Water Supply		Pump Capacity	
			Underground/ Static Tank	Terrace Tank	Near the Underground Static Tank (Fire Pump)	At the Terrace Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	iii) Above 24 m in height but not exceeding 45 m	One wet-riser per 500 m² floor area per floor. Riser shall be fully charged with adequate pressure at the topmost hydrant and shall be automatic in operation	150 000 l + 50 000 l if basement is sprinklered (*see* 7.12)	Nil	i) Same as in item IV (ii) (i) above ii) Stand-by pump as alternate source of power supply	Nil
	iv) Above 45 m in height	i) do ii) All the floors and basements if any to be sprinklered	200 000 l + 50 000 l if sprinklered (*see* 7.12)	Nil	i) 2 820 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Pump of multi-stage type or alternatively break pressure wet-riser system by interposing suction tanks and pumps at every 15 floor level Stand-by pump of equal capacity on alternate source of supply	Nil
V	INDUSTRIAL BUILDINGS (G)					
	i) Up to 15 m in height	One wet-riser-*cum*-down-comer for 500 m² floor area per floor	50 000 l	20 000 l	i) 2 280 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
	(NOTE — Buildings with ground floor only or with ground and floors with total floor area not exceeding 1 000 m² to be exempted.)					
	ii) Above 15 m in height but not exceeding 24 m	Wet-riser	150 000 l	—	i) Same as in item V (i) (i) above ii) Stand-by pump of equal capacity on alternate source of power supply	Nil
	(NOTE — Buildings above 24 m not to be permitted with exception of silos and processing installations such as fractional distillation columns and other such structures.)					

VI STORAGE (H) AND HAZARDOUS (J) BUILDINGS					
i) Single storey buildings	Ring main type hydrant system with mains, fully charged with adequate pressure at the remote hydrant	100 000 l (for aggregate area not exceeding 1 000 m²) 150 000 litres (for area exceeding 1 000 m²)	Nil	i) 2 280 l/min (2 850 l/min if sprinklered) with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant ii) Stand-by pump of equal capacity on alternate source of power supply if area exceeds 1 000 m²	Nil
ii) Up to 15 m in height	One wet-riser-*cum*-down-comer for 500 m² floor area per floor	150 000 l	20 000 l	i) Same as in item IV (i) (i) above ii) Same as in item IV (i) (ii) above	900 l/min with pressure not less than 300 kPa (3 kgf/cm²) at the topmost hydrant
(NOTE — Hazardous buildings above 15 m not to be permitted.)					
iii) Storage buildings above 15 m in height but not exceeding 24 m	One wet-riser-*cum*-down-comer for 500 m² floor area	150 000 l	—	i) Same as in item IV (i) (i) above ii) Same as in item IV (i) (ii) above	—
(NOTE — Storage building above 24 m not to be permitted.)					

Table 2 Size of Mains

(*Clause* 5.6)

Size of the Mains	Type of Building (*see* IS 1641 : 1988)	Height of Building
(1)	(2)	(3)
100 mm single outlet landing valves	I) Residential buildings (A)	
	i) Lodging housing	Above 15 m and not exceeding 45 m
	ii) Dormitory	
	iii) Family private dwellings	
	iv) Apartment houses	
	v) With shopping area not exceeding 250 m²	
	vi) Hotel buildings up to 3 star grade	Above 15 m in height but not exceeding 24 m and area not exceeding 600 m² per floor
do	II) Educational buildings (B)	Above 15 m but not exceeding 35 m
do	III) Institutional buildings (C)	
	a) For hospitals and sanitorium with beds not exceeding 100	Above 15 m but not exceeding 25 m
	b) For custodial places and mental institutions	Above 15 m but not exceeding 35 m
do	IV) Assembly buildings (D)	Above 15 m but not exceeding 24 m and total floor area not exceeding 500 m²/floor
do	V) Business buildings (E)	Above 15 m but not exceeding 24 m
do	VI) Mercantile buildings (F)	Above 15 m but not exceeding 24 m
do	VII) Industrial buildings (G)	Above 15 m but not exceeding 24 m
150 mm with twin outlet landing valves	VIII) All buildings classified under (i) to (iv)	Above 45 m
do	IX) All buildings classified under (v) above with shopping area not exceeding 250 m²	Above 24 m
do	X) All buildings classified under I (vi) above	Above 24 m and area exceeding 600 m²
do	XI) Hotel buildings of 4 star and 5 star grade	Above 15 m
do	XII) All buildings classified under II and III above	Above 25 m/35 m as applicable
do	XIII) All buildings classified under IV above	Above 24 m and area exceeding 500 m²/floor
do	XIV) All buildings classified under V above	Above 24 m
do	XV) All buildings classified under VI above	Above 24 m but not exceeding 35 m
do	XVI) All buildings classified under VII above	Above 24 m but not exceeding 35 m
do	XVII) All storage buildings (H)	Above 10 m but not exceeding 24 m

5.7 The rising mains/down-comer mains should be of galvanized iron pipes conforming to medium class of IS 1239 (Part 1) : 1979 and their fittings should be according to IS 1239 (Part 2) : 1982.

5.8 The position of risers should be located within lobby approach staircase or within the staircase enclosure when there is no lobby. However, the risers or the landing valves connected to the risers should not obstruct the means of escape, neither reduce the width of the passage of staircase in any way.

5.9 Landing valves should be installed on each floor level and on the roof, if accessible, in such a way that control line of landing valve is 1 to 1·2 m above the floor level. In the event of pump pressure being excessive at the lower floor levels in tall buildings a reducer should be provided in the landing valves to limit operating pressure to 5·5 kg/cm^2 (0·5 N/mm^2). The hoses, nozzles and branch pipes should be kept adjacent to the landing valves in wall boxes or in recesses.

5.10 In buildings with basements, the internal hydrants as well as the hose reel installations should be extended to cover the basement area also, over and above sprinkler system, as necessary.

5.11 A minimum of two hydrants connected to internal hydrant system should be provided within the courtyard of the buildings. These should preferably be sited adjacent to the roads along the compound wall and facilities provided for fire brigade appliances.

5.12 Fire hoses should be of sufficient length to carry water from the nearest source of water supply to the most distant point in the area covered by a hydrant, by the normal route of travel. For each internal hydrant (single headed), there should be a total length of not less than 30 m of 63 mm conforming to Type A of IS 636 : 1988 or provided in two lengths of not more than 15 m each wire wound with coupling together with branch pipe conforming to IS 2871 : 1983. Spare hose pipes, landing valves lugs, valves wheel, etc. Minimum of 10 percent of each item should always be kept in stock readily available. Such spare hoses also should be in length of not more than 15 m complete with coupling. Hoses and accessories should be kept in hose cabinet painted fire red (*see* IS 5 : 1978) and constructed preferably of wood with glass front. Wall boxes constructed of cast iron or sheet iron should be painted at regular intervals to obviate rusting and consequent damage to hose. A set of spare rubber washers packed in French chalk for the purpose of preservation should be kept readily available.

5.13 To avoid pilferage, components like landing valves, hose couplings, branch pipes, lugs, etc, made of aluminium alloy are recommended depending on weather conditions.

5.14 Unless impracticable by structural considerations, the landing valves should always be housed in hose boxes. Such hose boxes should be made of MS plates of 2 mm minimum thickness with glass front. The size of the box should be adequate to accommodate single/double headed landing valves with 2 or 4 lengths of fire hose each of 15 m length, and one or two branch pipes. The hose reel may or may not be accommodated inside the hose box. If the hose box is also to accommodate the hose reel, it should be of adequate dimensions. For single headed landing valve, the front opening glass door may be of single leaf, but for double landing valve, double leaf doors are recommended. The location of the riser main, along the landing valves and hose reel, etc, should be such as to leave enough clearance on both sides and also below the landing valve, for smooth operations. The landing valves should be so fitted to the riser main, that when the fire hose is connected to it, and charged with water under pressure, it will not form any kink. Consideration should also be given to allow adequate spaces around the valve to permit maintenance and testing.

5.14.1 For such buildings where narrow space does not permit fixing of hose boxes, the fire hoses, and hose reel could be fixed in suitable niches through which the riser main has been taken up. In such cases only a glass facing fixed on a frame of angle iron may be used. However, these may be used only for residential apartments.

5.15 Building fitted with wet-riser/wet-riser-*cum*-down-comer mains should have access roads to within 6 m from the boundary line of the building and the nearest wet-riser stack should not be more than 15 m from the boundary line of the building.

6 HOSE REELS

6.1 In addition to wet-riser systems, first aid hose reels should be installed on all floors of buildings above 15 m in height. The hose reel should be directly taken from the wet-riser pipe by means of a 37 mm socket and pipe to which the hose reel is to be attached. When taken from the landing valve, it should be connected to one of the female couplings of the double outlet landing valves of the wet-riser installation by means of an adapter. The hose reel should conform to Type A of IS 884 : 1985.

6.2 The hose reel should be sited at each floor level, staircase, lobby or mid-landing adjacent to exits in corridors in such a way that the nozzle of the hose can be taken into every room and within

6 m of any part of a room keeping in view the layout and obstructions. The doors provided for the hose reel recesses should be capable of opening to approximately 180°. When installation is in open areas, the position should be above head height and the nozzle retainer and the inlet valve should be at about 900 mm above floor level.

6.3 It is essential that the hose reels remain unobstructed and that they should be available for use at all times.

6.4 In buildings that have large open floor areas such as warehouses, the stacking arrangement should provide for unobstructed access to the hose reel. It may also be considered necessary to provide guard rails around the hose reel position to prevent stacking adjacent to it, care being taken that the guard rails do not obstruct the operation of the hose.

6.5 The length of hose reels should be such that no part of the floor so protected is more than 6 m away from the nozzle when the hose reel is fully extended.

6.6 The hose reels should preferably be installed in recesses so that they do not form obstructions on a route of escape.

6.7 Hose reel brackets should be firmly fixed to the wall.

7 WATER SUPPLIES AND PUMPING ARRANGEMENTS

7.1 For wet-riser mains and hose reels it is essential that pressures and flows should at all times be adequate to serve the designed number of jets likely to be used. This is irrespective of the source of water supply.

7.2 For wet-riser-*cum*-down-comer system, two pumps of different capacities (*see* Table 1) one for the wet-riser and the other for down-comer system should be installed. The pumps should be fed from normal source of power supply and also by an alternative source in case of failure of normal source.

7.3 For a wet-riser system, two automatic pumps should be installed to independently feed the wet-riser main, one of which should act as stand-by, each pump being supplied by a different source of power. The pump shall be arranged so that when acting as duty-pump, operate automatically when one or more hydrant is opened thus causing a drop in pressure. The stand-by pump should be arranged to operate automatically in case of failure of the duty pump. The system should have an interlocking arrangement so that only one of the pumps operate at a time.

7.4 Priming of the main pump and terrace pump in case of wet-riser-*cum*-down-comer, or both the pumps in case of wet-riser installation, should be automatic. This can be achieved either by having flooded suction, or by a priming tank with foot valve arrangement. However, a flooded suction is preferable.

7.5 Arrangements for draining a wet-riser main should be incorporated to enable any necessary repairs to be carried out.

7.6 To allow any trapped air in the rising main to escape when water is pressurized into system, air release valve should be incorporated above the highest outlet of each main.

7.7 To reduce the risk of hose bursting, arrangements should be made so that when the water is shut off at the nozzle the static pressure in any line of hose connected to a landing valve does not exceed 700 kPa (7 kgf/cm^2).

7.8 To reduce excess pressure at ground floor or lower floors [in excess of 400 kPa (4 kgf/cm^2) suitable arrangement (orifice flange or other measure)] should be incorporated in the landing valves.

7.9 For external hydrants, piping (water main) should be laid preferably underground, to avoid it getting damaged by moving vehicles, etc. To avoid rusting, underground pipes should be either of cast iron conforming to IS 1536 : 1976 or MS/GI [conforming to IS 1239 (Part 1) : 1979], in which case it should be properly treated with a coat of primary paint with two coats of bitumen paint. The pipes should be properly supported on pedestals — not more than 3 m apart. Underground pipes should be laid 1 m below to avoid damage during road repair, etc, and at road crossings where heavy vehicles are expected to pass, it should pass through RCC pipe for additional protection.

7.10 Air Vessel

To take care of small leakages in the system, an air vessel of appropriate size should be installed and connected to the wet-riser main.

7.11 Jockey Pump

For bigger buildings or major installations, where chance of such leakage is very considerable, it is desirable to install a small pump (using a small motor and 200/300 l/min pump) with pressure switches for automatic start and stop.

7.12 Using Wet-Riser System Pump for Partial Sprinkler System

In main high rise buildings, the basement is used for car parking/housing transformers/or storages and other floors may be used as shopping areas,

departmental stores, etc, the total area used for such purpose being small, in such cases, the same wet-riser pump may be used for feeding the sprinkler system provided that:

a) the total area of the basement to be protected is less than 500 m^2.

b) the total area utilized as shops departmental stores is less than 1 000 m^2.

c) the pump has a capacity of at least 2 850 l/min with suitable motor.

d) a separate stand-by pump of equal capacity is installed, either diesel driven, or by a generator of appropriate capacity — as indicated in **4.2.7**.

8 INITIAL TESTING

8.1 The system should be tested before use by charging with water to a pressure of 700 kPa (7 kgf/cm^2) measured at the inlet for a period of at least 30 minutes. During this period, an inspection of the system should be done to check that no leakage of water is taking place at any of the joints or landing valves and the pressure in the system does not drop by more than 50 kPa (0·5 kgf/cm^2).

8.2 After the test in accordance with **8.1** is completed, a flow test should be carried out.

9 MAINTENANCE

9.1 Periodic inspections of the vicinity of all hydrants should also be done to ensure that there are no obstructions impeding accessibility and that hydrant indicator plates are in position.

9.2 Periodic inspection should be done to ensure that all isolating valves for systems are kept locked in an 'open' position. Also flow and pressure should be checked to ensure that supplies have not deteriorated, leakage does not exist and that the entire system is in satisfactory condition.

9.3 Inlets, landing valves, drain valves, door hinges and locking arrangements to the inlet and landing valve boxes should be inspected every six months. Special attention should be given to all valves, spindles, glands and washers to ensure that they are in satisfactory condition, so that all equipment is ready for immediate use. Also following checks should be done:

a) Check on the cleanliness of storage tanks, and

b) Thorough check of the jockey pumps and their associated mechanical and electrical equipment.

9.4 Where any outlet on the rising mains is found to be defective and no replacement is immediately available, the whole valve assembly should be removed from the main and be replaced with a blanking off plate or plug, in order that the system remains operative.

9.5 Hose reels should be subjected to regular inspection to ensure that the inlet valve, the automatic on/off valve, if any, glands, tubing and shut off nozzle are sound and free from leaks, and also to ensure that the outlet of the nozzle is not choaked.

9.6 If jockey pumps have been installed, such pumps and the associated mechanical and electrical equipments should also be checked.

9.7 Once a year the hose reels should be completely run out and subjected to operational water pressure to ensure that the hose is in good condition and that the coupling joints are watertight. A flow test should be carried out to ensure that discharge of at least 0·5 l/s (30 l/min) is achieved. If it is not possible to test every hose reel, at least the highest reel on each rising main should be tested.

9.8 It is essential that all defects are rectified in the shortest possible time, to ensure that the fixed fire-fighting equipment is restored to a satisfactory condition in as short a time as possible.

9.9 Where, due to unforeseen difficulties it is necessary to leave an installation not available for use, the fire service should be informed immediately in order that alternative arrangements may be made to cover this deficiency should the need arise. In addition, a suitable notice to indicate that the installation is not available for use should be placed in a prominent position.

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
IS 5 : 1978	Colours for ready mixed paints and enamels (*third revision*)	IS 1536 : 1976	Centrifugally cast (spun) iron pressure pipes for waters, gas and sewage (*second revision*)
IS 636 : 1988	Non-percolating flexible fire fighting delivery hose (*third revision*)	IS 1641 : 1988	Code of practice for fire safety of buildings (general) : General principles and fire grading and classification (*first revision*)
IS 884 : 1985	First-aid hose-reel for fire fighting (*first revision*)		
IS 1239 (Part 1) : 1979	Mild steel tubes, tubulars and other wrought steel fittings : Part 1 Mild steel tubes (*fourth revision*)	IS 1726 (Part 1) : 1974	Cast Iron manhole covers and frames : Part 1 General requirements (*second revision*)
IS 1239 (Part 2) : 1982	Mild steel tubes, tubulars and other wrought steel fittings : Part 2 Mild steel tubulars and other wrought steel pipe fittings (*third revision*)	IS 2871 : 1983	Branch pipe, universal, for fire fighting purposes (*first revision*)
		IS 5290 : 1983	Landing valves (*second revision*)

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