IS 9668 (1990, Reaffirmed 2010): Provision and Maintenance of Water Supplies for Fire Fighting--Code of Practice (First Revision). UDC 614.842.62.004.5 : 006.76

Indian Standard

PROVISION AND MAINTENANCE OF WATER SUPPLIES FOR FIRE FIGHTING — CODE OF PRACTICE

(First Revision)

भारतीय मानक

आग बुझाने के लिए जल सप्लाई की व्यवस्था तथा अनुरक्षण की रीति संहिता

(पहला पुनरीक्षण)

UDC 614·842·62·004·5 : 006·76

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

September 1990 **Price Group 3**

Fire Fighting Sectional Committee, CED 22

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 24 January 1990, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

Water has been the main fire extinguisher media used to contain and extinguish fires from times immemorial. Water and foam in which water is used in large quantities also continue to be most commonly used extinguish media. For adequate fire fighting appliances are normally used with the water. Water is also used for the internal hydrants system, sprinkler systems and external hydrants therefore suitable guidelines for the provision of water supply so as to cover various fire risk areas are being covered in this standard. The requirements in this code have been kept minimum possible level in view of the shortage of water (as in some areas water for drinking is also not sufficiently available) however where circumstances need considering the safety aspects the requirements may be suitably increased.

This standard covering provision and maintenance of water supply and external hydrant systems, (covering installation inspection and maintenance) issued in year 1980. In this revision the provision of external hydrant system etc, have been separated and are being covered in detail in a separate new Indian Standard aligning with the provision of internal type fire hydrant systems covered in IS 3844 : 1989 'Code of practice for installation and internal hydrants and hose-reel on premises (*first revision*)' on the experience gained in the use of this standard, the requirements in respect of the provision of water supply has been up-dated keeping in line with the TAC requirements. The provision in respect of water supply requirements for sprinkler systems are being covered in a separate Indian Standard.

Indian Standard

PROVISION AND MAINTENANCE OF WATER SUPPLIES FOR FIRE FIGHTING — CODE OF PRACTICE

(First Revision)

1 SCOPE

1.1 This standard covers guidelines for the provision and maintenance of water supply for fire fighting.

2 GENERAL

2.1 Water supply requirements for fire fighting will depend on various factors like type of construction, nature of occupancy, type and quantities of materials handled or stored, process risks involved, neighbouring fire risks, fire detection and alarm arrangements, time likely to be taken for the fire brigade(s) to come into operation and so on. All these factors may differ very widely and so will be the requirement of water supplies. Requirement for each area may therefore vary and has to be worked out jointly by water supply engineers and fire experts after considering these factors.

3 SOURCE OF WATER SUPPLY

3.1 The essential requirements for any source of water for fire fighting are as follows:

a) Ready availability of the supply at all times,

b) Sources easily approachable and workable by the normal fire appliances, and

c) Sources located within a workable distance which should in no case be more than 1 km from the risk to be protected.

3.2 Normally such requirements are met with two types of water supply namely piped water supply (hydrant system) and static water tanks. However, on some occasions natural and man-made sources if available could be utilised for fire fighting in emergencies. The commonly found natural sources are rivers, canals, streams, ponds, lakes, pools, spring wells, etc, and man-made sources are reservoirs, pooling water basins etc. Therefore, while planning any system for water supply requirements such sources may also be considered and suitable arrangements made for their effective and quick use by the fire services like all weather approach routes, hard standing platforms, provision of suitable sumps, portable pumps in deep wells etc. In case of overhead reservoirs suitable number of 100 mm round thread or 63 mm instantaneous outlets may be provided on the main, outlets being controlled by separate control valves.

4 WATER SUPPLY REQUIREMENTS

4.1 For Towns/Cities

4.1.1 The fire risk in any town/city is seldom uniform throughout and it may vary widely in different areas. It may be the lowest in well laid out predominently residential locality, with small shopping centres and go on increasing in thickly populated congested areas, commercial centres, warehouses and industrial complexes. In addition to normal peace time requirements, some vulnerable towns/cities may require very large extra quantities to deal with special situations that may arise in war time or other emergencies to which the towns/cities may be exposed. These are generally termed as 'civil defence' towns. With so may variants, it may be desirable to work out the water supply requirements area—on locality-wise after considering various factors, but, this may not be possible in each and every case.

The overall requirements may, therefore, be worked out on population basis. But, while working out the detailed distribution system, the peculiar requirements for each area shall be examined and extra provision made where required.

4.1.2 It is recommended that generally for towns/cities, water for fire fighting shall be provided at the scale of 1800-l/min for every 50 000 population or part thereof for towns up to 3 lacs population and an additional 1800-l/min for every 1 lac population of more than 3 lacs. The requirement should be on the basis of 2 hours duration.

In addition to the population criteria, it should be ensured that sufficient water at the above scale is made available within every 1 km^2 area of the city/town and it should be ensured that it is equitably distributed. In the case of smaller towns with population of 1 lac and below the total requirements should be doubled.

4.1.3 For high risk areas like bazars, commercial centres, high rise buildings warehouses, industrial complexes, etc, extra provision shall be made considering each risk area separately. For extra high hazard risk like petrochemical chemical complexes extra provisions, on the external periphery shall be provided on. The provision in respect of highrise building are given in IS 3884 : 1989, there should be at least one

static tank of 220 000 litres capacity for every 1 km² area.

4.1.4 For civil defence towns/cities, the scale as prescribed under **4.1.2** may be doubled, both in respect of per minute and total requirements. The extra provision on this account shall be made in the form of static sources as far as possible.

4.2 For Industries

4.2.1 Industries vary very widely in size and fire risk. There are small scale industries located in small shed(s) employing only a few persons. On the other extreme, there may be big industries which are spread over hundreds of acres and employ thousands of persons. Risk wise also, there are low to medium risk industries handling and storing mostly non-combustible or ordinary combustible materials against the very high fire risk industries handling and storing sizeable quantities of highly combustible and flammable substances. Therefore, the guiding factor shall be to determine the number of fire fighting jets which are likely to be employed in case of a major fire outbreak in the industry. For this purpose, the risk category of the industry should be first determined, which will quantify the number of fire fighting jets vis-a-vis the quantity of water required to be provided.

4.2.2 The industries may be divided into three main risk that is light hazard (covering group A to F), moderate hazard (covering group G and G-1) and high hazard (covering group H and J) as follows:

a) For all risks coming under light hazard category and with single unobstructed floor area not exceeding 1 000 m², it shall have water storage for fire fighting equivalent to 1 hour pumping capacity minimum, when using two strong water jets simultaneously — each jet consuming 600 lpm. Where the area exceeds 1 000 m², additional quantity at the rate of 50 percent of above shall be provided subject to a minimum of 2 hours pumping capacity.

b) For all risks coming under moderate hazard category and with single unobstructed floor area not exceeding 1 000 m², it shall have water storage for fire fighting equivalent to 2 hours pumping capacity minimum, when using 4 strong water jets simultaneously — each jet consuming 600 lpm Where the area exceeds 1 000 m², additional quantity at the rate of 50 percent of above shall be provided, subject to a minimum of 2 hours pumping capacity.

c) For all risks coming under high hazard category and with single unobstructed floor area not exceeding 1 000 m², it shall have water storage for fire fighting equivalent to 3 hours pumping capacity minimum, when using 6 strong jets simultaneously — each jet consuming 600 lpm. Where the area exceeds 1 000 m², additional quantity at the rate of 50 percent of above shall be provided subject to a minimum of 4 hours pumping capacity.

4.2.3 However, on single unobstructed floor area not exceeding 1 000 m², it shall have water storage for fire fighting equivalent to 4 hours pumping capacity minimum, when using 8 strong water jets simultaneously — each jet consuming 600 lpm. Where the area exceeds 1 000 m², additional quantity at the rate of 50 percent of above shall be provided subject to a minimum of 4 hours pumping capacity.

4.2.4 The quantity of water requirement as mentioned above, shall be stored in the form of one or more static tanks.

NOTE — In case of one tank it should be in two equal interconnected compartments.

In case of an efficient municipal fire hydrant system, the quantity of water required to be stored in static tanks could be halved, however the capacity in any static tanks shall not be changed.

In case of any industrial unit which has its own fire hydrant system installed, the entire quantity of water could be stored in a single large tank/ compartmental tank/reservoir with a well designed ring main of adequate size on which hydrants can be installed.

4.2.5 For flammable liquid tank farms, the minimum water requirement for fire fighting shall be calculated separately for use of foam, and for cooling of the affected tanks and also the surrounding tanks, added together.

4.2.6 For tank farms with fixed foam installation system, the capacity of water tank shall be as follows:

a) At the minimum rate of water solution calculated at 4·5 lm² of liquid surface area (tank surface), for a minimum time of 30 minutes. If fixed foam monitors are installed, an additional quantity of 900 litres per minute for at least another 30 minutes duration shall be provided, if number of monitors are many, provision for at least two monitors at the rate of 900 lpm each to be calculated.

b) For cooling purpose of adjoining tanks, additional quantity of water shall be provided at the rate of 10 lpm/ m² of exposed surface of the next tank, for a period of at least 1 hour.

4.2.7 Process Units

Water requirement for process units shall be depending upon the risk, but in no case less than as laid down in **4.2.3** above.

4.2.8 Administrative buildings in factories etc. shall be considered as light hazard, and the water quantity and number of hydrants catered accordingly.

4.2.9 Storage Risks

For storage risks engineering stores shall be classified as light hazard category. General stores as ordinary hazard and combustible or flammable stores as high or extra high hazard category. In case of such combined risk, the risk category will be decided by its predominent risk.

5 STATIC WATER TANKS

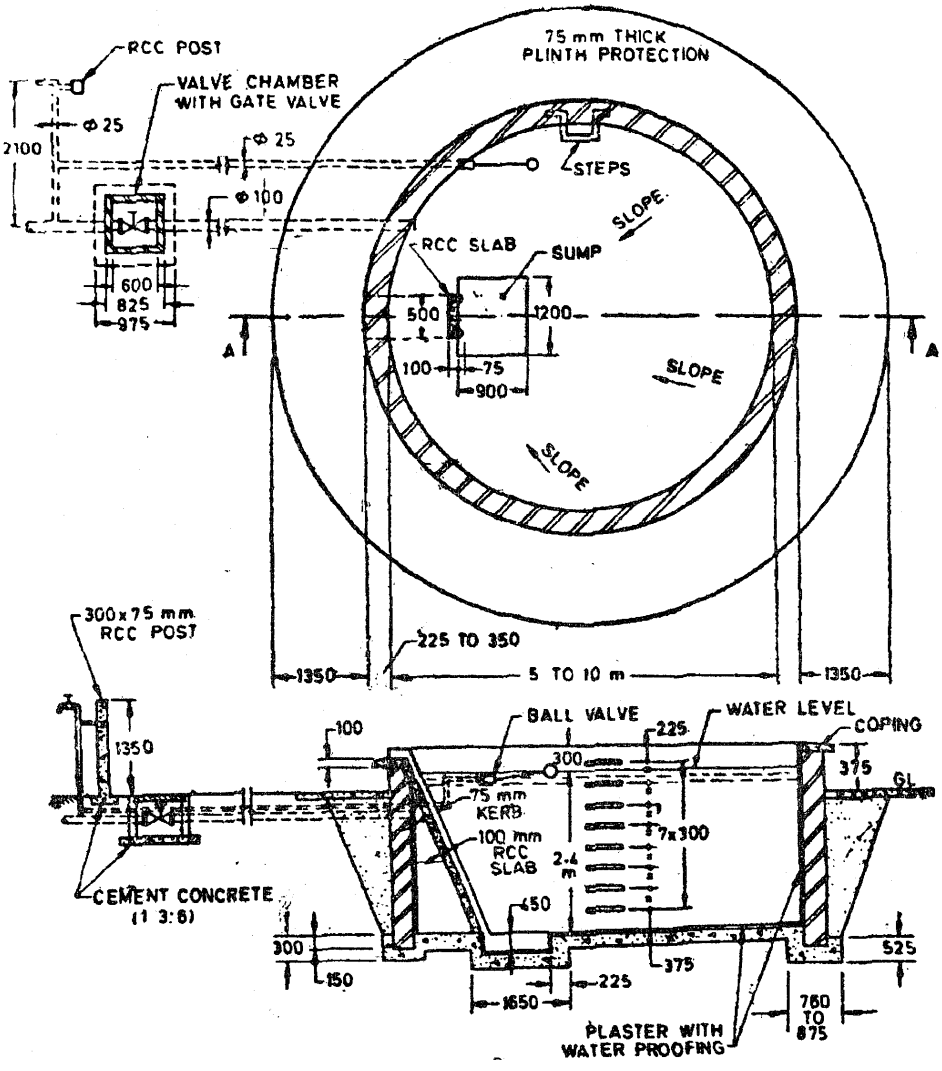
5.1 Static water tanks are very useful sources of water supplies for major fire fighting. They can be provided to supplement the first hydrant system or independently where provision of fire hydrants is not feasible economically or due to various other reasons. Static water system has many advantages over the hydrant system. This system is much more economical, more reliable, less prone to damage or defects and helps to build huge reserve to meet any eventualities. While planning any water supply system for fire fighting in towns, cities and industries, suitable provision of static water tanks shall always be kept in view. For civil defence towns/cities and all type of industrial establishment, at least 50 percent of the total water supply requirements for fire fighting shall always be in the form of static water tanks.

5.2 Static water tanks for fire fighting should be underground with water at ground level. They can be of any shape and dimensions, but the depth shall normally not exceed 2·5 m. For multi-storey buildings terrace tank may be provided.

NOTE — In case of deeper tanks, submersible pumps be provided.

5.3 For towns/cities and other locations where they are accessible to public, the static tank should be completely covered and provided with suitable manholes for lowering of the suction hoses.

5.4 Inside industrial establishments the static water tanks can be of open type having small parapet walls of height not exceeding 50 cm above ground level. Such tanks may, as far as possible, conform to Fig. 1. Where extra



All dimensions in millimetres unless otherwise specified.

FIG. 1 A TYPICAL STATIC WATER TANK

protection is required, barbed wire fencing, etc, may be provided with suitable openings, for lowering of the suction hose.

5.5 All static water tanks for fire fighting shall normally be located within 100 m of the risk to be protected.

5.6 The static water tanks shall be easily approachable by all types of fire appliances held at the fire station(s) providing fire cover in the area. All weather approach road of adequate size shall be provided. Provision of suitable number of manholes shall be made available for inspection, repairs and inspection of static tanks, etc.

5.7 Cement concrete platforms (hard standings) shall be provided at suitable locations around the static water tanks for prolonged operations by the fire pumps.

5.8 Each static water tank should be provided with sump(s) to allow the use of the total quantity of water for fire fighting and also to facilitate maintenance and repair of tanks. The sump(s) may be of the size 1 m × 1 m × 45 cm (depth). The sumps should be located on the side(s) from where the fire pumps are to come into operation.

5.9 U-shaped steel bar steps or any other suitable arrangement shall be provided for men to enter the static water tanks as and when required.

5.10 All static water tanks shall be provided with suitable filling arrangements to make up the evaporation losses, refilling after cleaning/repairs and for replenishing water supplies during fire fighting operations. The filling arrangements shall be of the maximum capacity possible and the tanks shall be connected by the biggest size of mains available in their vicinity at the rate of not less than 1 000 l/minute.

5.11 Suitable indicating plates shall be fixed to the nearest wall or a suitable posts erected for the purpose near each static water tank. The indicating plates can be made of vitreous enamelled mild steel, cast iron, aluminium alloy or plastic. The plates shall be yellow in colour with letter 'SWT' and the capacity in litres marked in black.

6 INSPECTIONS, CHECKS AND MAINTENANCE

6.1 Periodical checking and proper maintenance of water supplies is as important as their provision. Since special water supply systems for fire fighting are not in daily use, many times, defects developing over a certain period may not be observed unless periodical checks are exercised. The system failing to come into operation at the time of any fire can defeat the very purpose for which the system has been provided and also result in very embarrassing situations to the fire and other administrative authorities of the area. Such situations are to be avoided at all cost and this can be ensured only when all parts of systems are constantly checked and maintained in perfect working order all the time.

6.2 Reservoirs

6.2.1 Required level of water shall always be maintained and this shall be checked daily by the pump operators and incharge water works in each shift before assuming charge.

6.2.2 A monthly inspection of the reservoirs shall be carried out by a responsible officer of the water works to ensure that the reservoirs are constructionally sound and there is no seepage or leakage from any portion. At this time, note may be taken of any accumulation of mud, sand, weeds and other undergrowth which can reduce the capacity of the reservoir and obstruct free flow of water. The required remedial action may be taken.

6.2.3 All reservoirs shall be periodically cleaned, periodicity for such cleaning to be determined and laid considering the local conditions. Before emptying any reservoir for cleaning and/or repairs, the other compartment/reservoirs shall be kept full and duly connected to the system.

6.3 Static Water Tanks and Natural Sources

6.3.1 Static water tanks and other natural sources for fire fighting shall be inspected as often as possible. The periodicity for such inspections shall be determined and laid down depending on the local conditions. However, for cities and towns, each static or natural source shall be inspected at intervals not exceeding one month and for industrial establishments once every week. The record of all such inspections shall be maintained and remedial action for any defects observed taken immediately or priority basis.

6.3.2 The following action shall be taken during the monthly/weekly inspection:

a) Level of the water supply shall be checked and noted.

b) Causes for any unusual drop in the level may be investigated and reported to higher authorities for further investigations and remedial action.

c) In the case of static water tanks drop of level due to evaporation and other normal causes, it shall be made good by opening the filling valves. In the case of open static water tanks, some water shall be allowed to overflow to avoid breeding of mosquitos, etc.

d) Static tanks, sumps and jack wells shall be examined for any signs of cracks or other constructional damages. Accumulation of mud, sand, weeds and other undergrowth shall be noted and action taken for their removal.

e) Condition of approach roads, hard standing platform, parapet walls, fencing, manhole covers, indicating plates, etc, shall be examined and recorded.

f) Any obstruction in the approach of the fire appliance to the sources of supply shall be removed.

6.3.3 All static water tanks, sumps and jack well shall be emptied, cleaned, repaired and whitewashed at periodical intervals. Open static water tanks shall be so cleaned once every 6 months For the covered static water tanks, periodicity may be determined according to the local conditions, but they shall be thoroughly cleaned at least once every 2 years.

6.3.4 While emptying any static water tank for cleaning or repairs, it shall be ensured that the other neighbouring tanks are full and in serviceable condition. As far as possible, only one tank shall be taken for repairs and maintenance at a time.

6.3.5 The use of static water tanks and other natural sources shall be made in drills and practices as often as possible. Any difficulties observed in approach and working of the fire appliances recorded and remedial action taken.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. CED 22 (4793)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	331 01 31 331 13 75
Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	2 18 43
Southern : C.I.T. Campus, IV Cross Road, MADRAS 600113	41 29 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE, FARIDABAD, GHAZIABAD, GUWAHATI. HYDERABAD. JAIPUR. KANPUR. PATNA. TRIVANDRUM.

Printed at Swatantra Bharat Press, Delbi, India