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**IS : 5888 - 1970**

*Indian Standard*

**CODE OF PRACTICE FOR  
DESIGN AND CONSTRUCTION OF  
FIRE SERVICE DRILL-TOWER**

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**BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
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# Indian Standard

## CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FIRE SERVICE DRILL-TOWER

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# *Indian Standard*

## CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FIRE SERVICE DRILL-TOWER

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 22 August 1970, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Drill-tower is an essential feature of a fire-station. Its purpose is to provide facilities to the fire service personnel to carry out practice drills with a view to keep themselves in trim.

**0.3** The ideal drill-tower should provide building features, like, doors, windows, etc, of such types which are akin to those normally found in buildings in the area covered by the fire service. But, this may not always be possible because of various reasons, such as small size of the brigade, small area covered by it, economy in construction, etc. For the same reasons, it may also be necessary to resort to a cheaper construction and/or to utilize the drill-tower for purposes other than drills.

**0.4** A common practice is to utilize the drill-tower for drying hoses also, suspended from the ceiling. At small and medium sized stations this should be both, economical and practicable. But, at very large stations, this may not be very practicable. Besides taking up available space which could be better utilized for drills and exercises, it may require the construction of the drill-tower to be extra heavy, because a large number of hoses may have to be dried simultaneously. For such stations, the arrangement for hose drying may be made in hose drying room where air currents and temperature may be controlled.

**0.5** Another suitable use for a drill-tower is to use it, or portions of it, as a smoke-chamber for practice in the use of breathing apparatus. But, this is also recommended for small and medium sized stations where breathing apparatus is actually in use. For large stations, a well designed smoke-chamber should be provided as an independent feature.

**0.6** Considering the fact that the drill-tower may be required to be constructed in different parts of the country, having different soil strata,

the foundation design may vary. This feature has, therefore, not been dealt with in this standard, except for giving the general functional requirements only.

**0.7** This code of practice represents a standard of good practice and, therefore, takes the form of recommendations.

**0.8** In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

**0.9** 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.

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## 1. SCOPE

**1.1** This standard lays down the requirements for functional design, materials, dimensions and location of the 'fire service drill-tower'.

## 2. MATERIAL

**2.1** Materials available locally are likely to be most suitable for construction of the drill-tower provided that these have the necessary strength. The strength of materials shall be calculated taking into consideration the overall design of the drill-tower and the purpose for which each is used. The following materials, when used for construction, shall satisfy the requirements given against each.

**2.2 Aggregate** — Aggregate used for making concrete for foundation, floors, lintels, etc, shall conform to IS: 383-1963†.

**2.3 Bricks** — Bricks for masonry work shall conform to IS: 1077-1968‡.

**2.4 Cement** — Cement used shall conform to IS: 269-1967§ or IS: 455-1967||.

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

†Specification for coarse and fine aggregate from natural sources for concrete (*revised*).

‡Specification for common burnt clay building bricks (*first revision*).

§Specification for ordinary, rapid-hardening and low heat Portland cement (*second revision*).

||Specification for Portland blastfurnance slag cement (*second revision*).

**2.5 Mild Steel Flats and Sections** — Mild steel flats and sections used for ladders and structure of the steel tower shall conform to steel St. 32-0 of IS: 1977-1962\*.

**2.6 Nuts and Bolts** — Nuts and bolts shall conform to IS: 1363-1967† or IS: 2585-1968‡.

**2.7 Reinforcement** — Steel reinforcement used for concrete shall conform to IS: 432 (Part I)-1966§, IS: 432 (Part II)-1966||, IS: 1139-1966¶, IS: 1566-1966\*\* or IS: 1786-1966††.

**2.8 Fibre** — Fibre rope used for the hoisting shall be good quality sisal rope having a breaking strength of not less than 100 kgf (*see also* IS: 1321-1970‡‡).

**2.9 Sand** — Sand used for making concrete and mortar shall conform to IS: 383-1963§§ and IS: 2116-1965||| respectively.

**2.10 Timber** — Timber used for facing the window sills and for the hose suspending toggles shall be well seasoned hard wood. Species of wood suitable for this purpose are given in Appendix A.

**2.11 Wire Rope** — Where wire rope is used for hoisting the hoses, it shall be corrosion resistant and shall have a breaking strength of not less than 100 kgf (*see also* IS: 3459-1966¶¶).

### 3. TYPES

**3.1** This standard covers the functional design requirements of the following types of drill-towers:

*Type A* — masonry towers suitable for large fire stations (*see* Fig 1).

These do not have arrangements for drying hoses and are not normally expected to be used as smoke-chambers.

\*Specification for structural steel (ordinary quality) (first revision).

†Specification for black hexagon bolts, nuts and lock nuts (diameter 6 to 39 mm) and black hexagon screws (diameter 6 to 24 mm) (first revision).

‡Specification for black square bolts and nuts (diameter range 6 to 39 mm) and black square screws (diameter range 6 to 24 mm) (first revision).

§Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part I Mild steel and medium tensile steel bars (second revision).

||Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part II Hard-drawn steel wire (second revision).

¶Specification for hot rolled mild steel and medium tensile steel deformed bars for concrete reinforcement (revised).

\*\*Specification for hard-drawn steel wire fabric for concrete reinforcement (first revision).

††Specification for cold twisted steel bars for concrete reinforcement (revised).

‡‡Specification for sisal rope (first revision).

§§Specification for coarse and fine aggregates from natural sources for concrete (revised).

|||Specification for sand for masonry mortars.

¶¶Specification for small wire ropes.

*Type B*—masonry towers suitable for small and medium sized fire stations (see Fig. 2). These have arrangements for drying hoses and sections of the drill-towers may be used as smoke-chambers for breathing apparatus training/exercises.

*Type C*—steel towers suitable for small and medium sized fire stations (see Fig. 3). These have arrangements for drying hoses and sections of the drill-towers may be used as smoke-chambers for breathing apparatus training/exercises.

*Type D*—steel towers suitable for small and medium sized fire stations (see Fig 4). These have arrangements both for drill and for hose drying purposes. These can not be used for breathing apparatus training exercises for which a separate smoke-chamber shall be necessary. This type of drill towers have arrangements for suspending the hoses for drying in the centre and, when hoses are not being dried, the complete floor area can be utilized for drill purposes by closing the central hatches by removable boards. This enables the floor area to be reduced and consequent economy in construction. The height of these towers is, however, less and hoses exceeding 25 m cannot be dried conveniently.

## **4. LOCATION**

**4.1** The drill-tower shall be constructed away from the fire station main block in a corner of the drill-yard where maximum clear space shall be available in front of the drill-tower to enable the drills and exercises to be carried out. The Type 'A' drill-tower shall be so constructed that it is possible to use any or all its faces for carrying out drills and exercises.

**4.2** Where possible, Type 'B', 'C' and 'D' drill-towers shall be associated with the hose repair shop and the hose store in a manner most convenient to the cleaning, drying, repairing and storage of hoses, that is, these facilities shall be provided close or adjacent to the drill-tower. In any case, the hose washing space shall be adjacent to the hose drying section of these types of drill-towers.

## **5. FOUNDATION**

**5.1** The foundation design of all types of drill-towers may vary according to the soil strata at the place where these may be constructed. It shall comply with the requirement prescribed in IS: 1904-1966\*.

**5.2** The foundation of the steel towers shall, besides being laid on a hard bed, be sufficiently heavy to prevent the tower from toppling over during use or in high wind. The superstructure of such towers shall preferably be bolted on to steel posts of adequate strength and length, with cross pieces at the bottom ends, embedded in heavy concrete.

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\*Code of practice for structural safety of buildings : foundations (first revision).

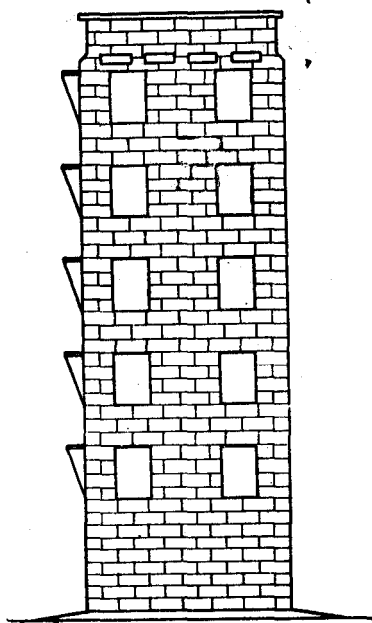
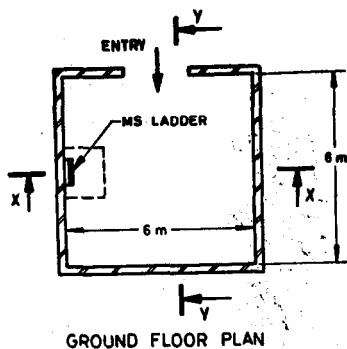


FIG. 1 FIRE SERVICE DRILL-TOWER, TYPE 'A'—Contd

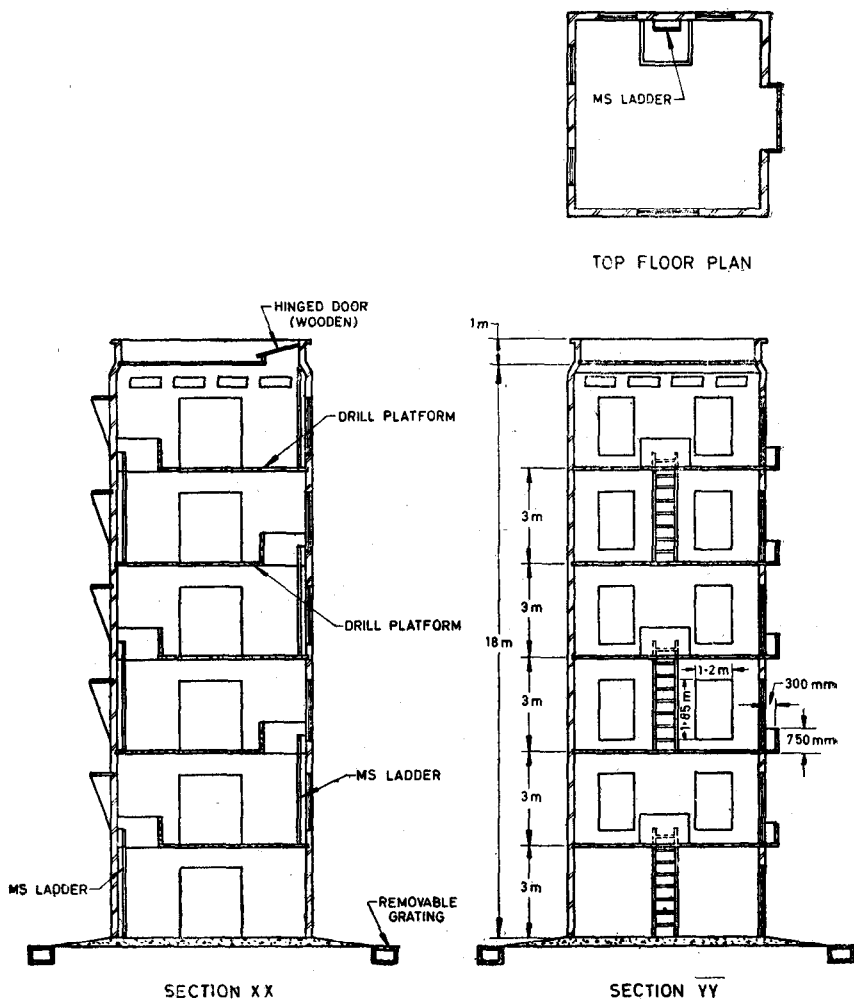


FIG. 1 FIRE SERVICE DRILL-TOWER TYPE 'A'

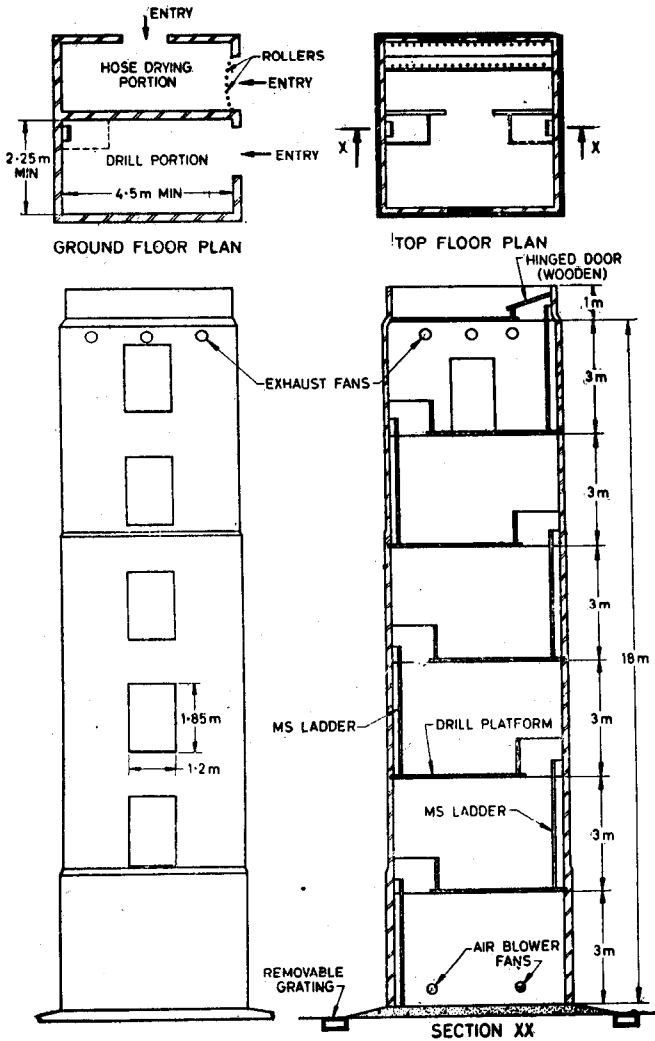


FIG. 2 FIRE SERVICE DRILL-TOWER TYPE 'B'

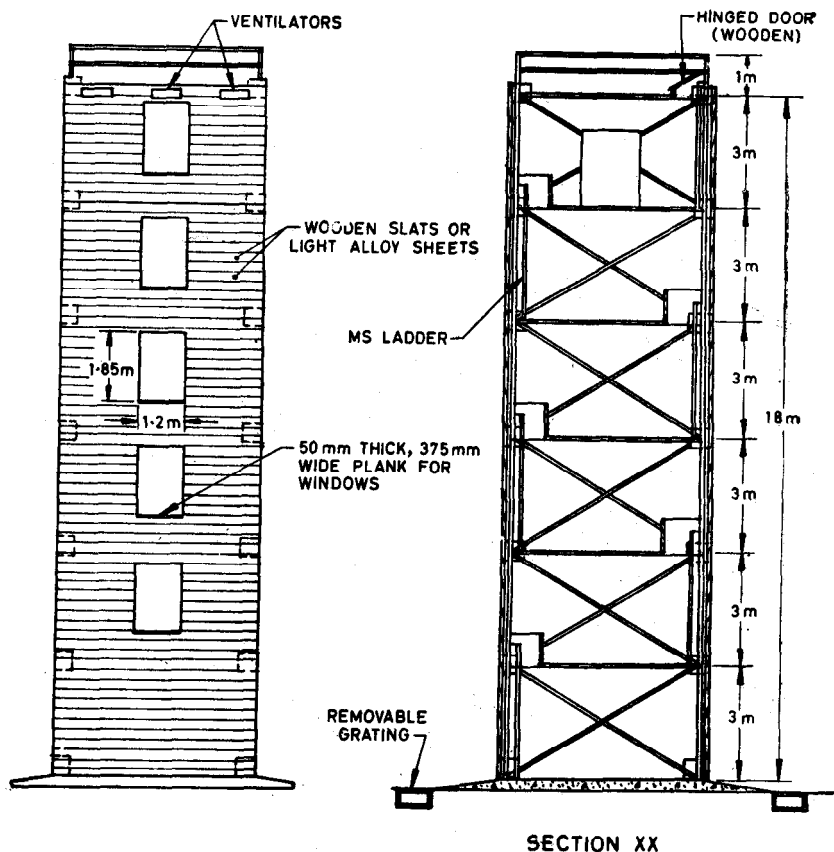
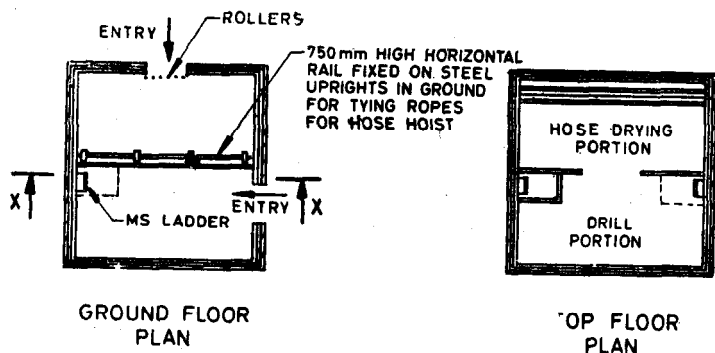


FIG. 3 FIRE SERVICE DRILL-TOWER TYPE 'C'

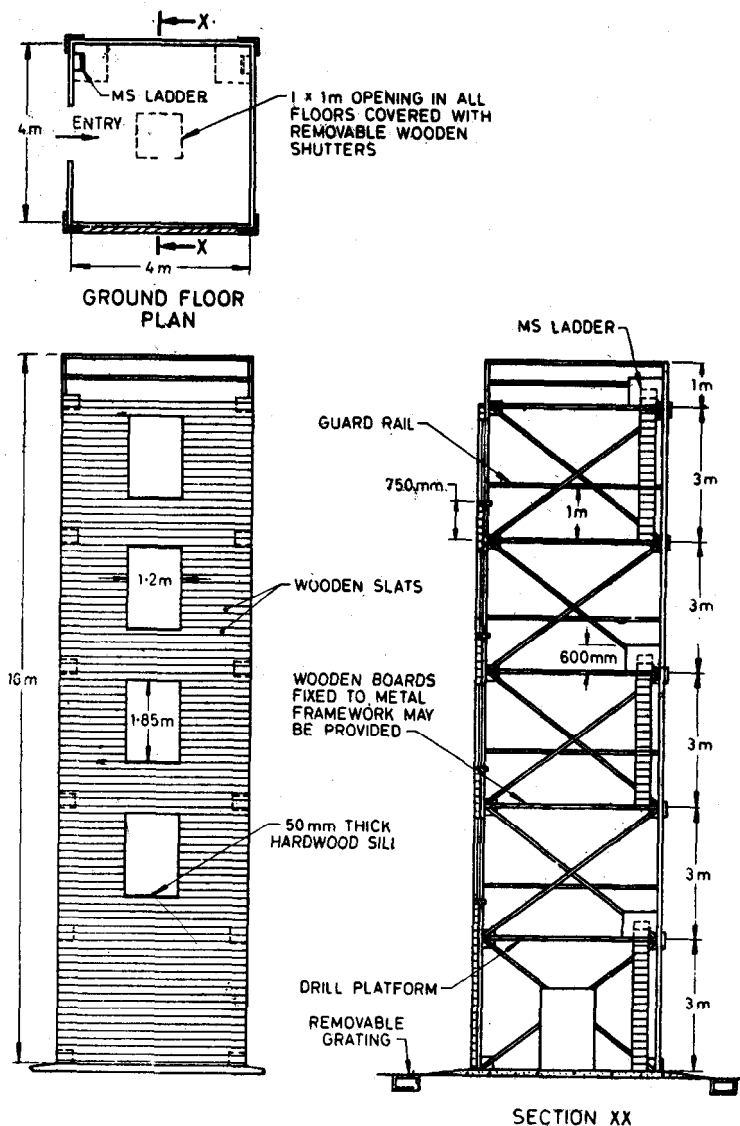


FIG. 4 FIRE SERVICE DRILL-TOWER TYPE 'D'

## 6. DESIGN CONSIDERATIONS

**6.1** While the design details may vary according to individual fire brigade requirements, the drill-tower shall satisfy the functional aspects given in 6.2 to 6.6.

**6.2 General** — The functional requirements given in 6.2.1 to 6.2.11 shall apply to all types of drill-towers.

**6.2.1** The height of the drill-tower shall not be less than 18 m for Types 'A', 'B' and 'C' and not less than 15 m for Type 'D', so as to enable drills to be carried out with all types of ladders used by the fire brigade.

**6.2.2** The size of the internal drill platforms shall be not less than  $4.5 \times 2.25$  m for Types 'A', 'B' and 'C' and not less than  $4.0 \times 4.0$  m for Type 'D' towers. Type 'D' drill-towers shall also have  $1 \times 1$  m square hatch in each floor except the top-most one.

**6.2.3** The drill platforms shall be provided at increments of 3 m height.

**6.2.4** Access shall be provided from one platform to another by means of mild steel ladders staggered to reduce accident hazard.

**6.2.5** All faces of the drill-tower intended to be used for drills shall be not less than 5 m wide each except in case of Type 'D' in which each face used for drills shall be not less than 4 m wide, and shall be in one vertical plane. Coping and mouldings shall not be provided except where necessitated by the window design. In any case, at least one vertical row of windows shall be free from projections.

**6.2.6** Each window shall be 1.85 m high and 1.2 m wide, having a distance of 3 m from sill to sill in each vertical row, the sill of the lowest window being 4 m above ground level. Each sill shall be about, but not exceeding 375 mm in width and shall be at a height of 750 mm above the internal platform.

**6.2.7** Hold fasts shall be provided above as well as vertically along each window.

**6.2.8** Each sill shall be faced with a 50 mm thick hard-wood plank bolted or clamped to it securely.

**6.2.9** The yard surface at the base of the drill-tower shall slope gently away from it to a grating covered channel to ensure efficient drainage.

**6.2.10** Each floor of the drill-tower shall be adequately illuminated internally. The switches for the lights shall be conveniently placed at each floor near the internal ladders and on the walls. In addition, a master switch controlling all internal lights shall be fitted outside the tower entrance. The lights in the hose drying section, where applicable, shall be on a separate circuit and shall be controlled by another master

swith outside the entrance to that part of the tower. Where the drill-tower is also to be used as a smoke chamber, protected flush-fitting lights shall also be provided in the walls at floor level on each drill platform in addition to the normal lighting. All such lights shall be controlled by a master switch outside the entrance to the drill section of the tower.

**6.2.10.1** All internal wiring shall be done in accordance with IS: 732-1963\*.

**6.2.11** A dry riser with an outlet on each floor shall be installed in the drill-tower.

**6.3 Type 'A' Drill-Tower** — A representative design of the Type 'A' drill-tower is shown in Fig. 1. In addition to the general design consideration given in 6.2, this type of tower shall also conform to the provision made under 6.3.1 to 6.3.5.

**6.3.1** This type of tower shall not have any arrangement for drying hose. It is not normally expected to be used as a smoke-chamber. But, where it is desired to be used for such purpose, the doors and windows shall be so designed that it is possible to seal them effectively.

**6.3.2** The internal floor measurements of the tower shall be  $6 \times 6$  m.

**6.3.3** Entrance to the tower shall be through the rear only.

**6.3.4** Windows shall be provided on all faces of the tower. These shall be of varied types/designs to correspond to the types/designs of windows normally provided in the buildings in the area covered by the fire brigade. But, at least one vertical row of windows shall have no projections.

**6.3.5** Drains shall be provided from each floor of the tower and these shall be arranged to drain into the external drain mentioned in 6.2.9.

**6.4 Type 'B' Drill-Tower** — A representative design of the Type 'B' drill-tower is shown in Fig 2. In addition to the general design considerations given in 6.2, this type of tower shall also conform to the provisions made under 6.4.1 to 6.4.5.

**6.4.1** This type of tower shall have facilities for drills, hose drying and for breathing apparatus training/exercises.

**6.4.2** The overall internal floor measurements of the tower shall be  $4.5 \times 4.5$  m. Out of this, a clear floor area of  $4.5 \times 2.25$  m shall be provided for drills and the remaining, minus the thickness of the partition wall, for hose drying.

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\*Code of practice for electrical wiring installations (system voltage not exceeding 650 volts) (revised).

**6.4.3** The drill and hose drying portions of the tower shall be separated by a continuous vertical partition, having only one door in it at the top drill platform level to provide access to the top of the hose drying section.

**6.4.4** Entrance to the drill section of the tower shall be from the side and not from the drill-face.

**6.4.4.1** The drill section shall have a single vertical row of windows as shown in Fig. 2.

**6.4.4.2** The external walls of the drill section shall be fitted with simple louvres just below the ceiling. It shall be possible to close or open the louvres as desired.

**6.4.4.3** Drains shall be provided from each floor of the drill section and these shall be arranged to drain into the external drain mentioned in 6.2.9.

**6.4.4.4** The doors and windows of the drill section shall be so designed that these could be effectively sealed off if any floor or the whole of the drill section of the tower is required to be used as a smoke-chamber.

**6.4.5** Entrance to the hose drying section shall be through a separate door. This shall have direct access to the hose washing space. Rollers shall be fitted to the lintel and sides of the door frame to prevent chafing of hose as it is drawn into the tower for being hoisted up for drying.

**6.4.5.1** The hose drying section shall have a clear hanging space for a number of lengths of hose not less than the full complement of hose carried on the appliances at the station. Arrangement shall be made to suspend each length of hose independently or to suspend up to two lengths side by side on the same hoisting attachment. The height at which the point of suspension for the hoses are fixed shall be not less than 17 m from the floor of the tower.

**6.4.5.2** The hoisting arrangement shall comprise of a number of pulleys fitted to a steel joist or joists in the ceiling. A fibre or wire rope of suitable length shall be reeved through each pulley. At one end of this rope shall be fitted a wooden toggle for suspending the hose(s) and the other end shall either be secured to a hook, fitted to the wall at one metre height from the floor, or to a suitable hand winch, fitted to the wall in the same position. It is desirable that a single winch is not used for more than two ropes. Where a number of ropes are to be hoisted by a single winch, it shall be power-operated with alternative hand operation in case of power failure. The power hoist shall be capable of being controlled from the top or the bottom of the tower.

**6.4.5.3** Blowers and exhausters shall be fitted to the three external walls of the hose drying section, one each at the floor and ceiling levels in the two smaller walls and two and three respectively at the floor and

ceiling levels in the larger wall. These shall blow in air at floor level and blow out air at the ceiling level. All blowers and exhausters shall be controlled by a master switch near the door inside the hose drying section of the tower.

**6.4.5.4** A drain shall be provided at floor level in the hose drying section. This drain shall be designed to drain into the external drain mentioned in 6.2.9.

**6.5 Type 'C' Drill-Tower**—A representative design of the Type 'C' drill-tower is shown in Fig 3. In addition to the general design considerations given in 6.2, this type of tower shall also conform to the provisions made under 6.5.1 to 6.5.3.

**6.5.1** This type of tower shall have facilities for drill and hose drying and sections of the tower may be used as a smoke-chamber for breathing apparatus training/exercises.

**6.5.2** The overall internal measurements of the tower shall be  $4.5 \times 4.5$  m.

**6.5.3** The design requirements of this type of tower shall be the same as for Type 'B' towers except that aluminium sheets or wooden slats shall be used for the wall covering and partition between the drill and hose drying sections over a steel structure.

**6.6 Type 'D' Drill-Tower**—A representative design of Type 'D' drill-tower is shown in Fig 4. In addition to the general design considerations given in 6.2, this type of tower shall conform to the provisions made under 6.6.1 to 6.6.5.

**6.6.1** This type of tower shall have facilities both for drill and for hose drying purposes. This type of tower cannot be used for breathing apparatus training/exercises (see 3.1).

**6.6.2** The tower shall incorporate removable steel frame structure on cement concrete foundation. The tower shall be left open on all sides, except the side to be used for drills which shall be covered with wooden slats or aluminium sheets. A 1-m high guard rail shall be provided on the open faces at all floor levels above the ground floor.

**6.6.3** There shall be an opening of 1-m square in the centre of each floor through which delivery hoses could be suspended from the top floor ceiling. Means shall be provided by which the opening in the centre of each floor could be completely closed, when not required, by a wooden frame of solid teak wood battens not less than 50 mm thick in the form of a hinged flap(s) when the hatch is being used for drill purposes. The hatch shall also be provided with a collapsible guard rail around at each floor level.

**6.6.3.1** The hoisting arrangement shall comprise of a number of pulleys fitted to steel joist(s) in the top floor ceiling. A rope of suitable strength shall be received through each pulley. At one end of this rope shall be fitted a wooden toggle for suspending the hose(s) and the other end shall be secured to a stanchion fitted in the centre of the ground floor, the rope passing along the hatches. Hand operated winch(es) may be fitted for hoisting hoses, if necessary.

**6.6.4** The drill section shall have a single vertical row of windows as shown in Fig. 4.

**6.6.5** Drains shall be provided from each floor of the drill section and these shall be arranged to drain into the external drain mentioned in 6.2.9.

## APPENDIX A

(Clause 2.10)

### SPECIES OF TIMBER RECOMMENDED FOR WINDOW SILL FACING AND HOSE SUSPENSION TOGGLES

SL No.	BOTANICAL NAME	TRADE NAME	DEGREE OF TREATABILITY OF HEARTWOOD
1.	<i>Albizia lebbbeck</i> Benth.	<b>kokko</b>	C
2.	<i>Albizia odoratissima</i> Benth.	<b>kala-siris</b>	E
3.	<i>Albizia procera</i> Benth.	<b>safed-siris</b>	C
4.	<i>Artocarpus chaplasha</i> Roxb.	<b>chaplash</b>	D
5.	<i>Artocarpus hirsutus</i> Lamk.	<b>aini</b>	—
6.	<i>Artocarpus heterophyllus</i> Lamk.	<b>Kathal</b>	—
7.	<i>Cedrus deodara</i> D. Don	<b>deodar</b>	C
8.	<i>Chloroxylon swietenia</i> DC.	<b>satinwood</b>	—
9.	<i>Dalbergia latifolia</i> Roxb.	<b>rosewood</b>	—

Sl. No.	BOTANICAL NAME	TRADE NAME	DEGREE OF TREATABILITY OF HEARTWOOD
10.	<i>Dalbergia sissoo</i> Roxb.	<b>sissoo</b>	E
11.	<i>Holoptelea integrifolia</i> Planch.	<b>kanju</b>	B
12.	<i>Lagerstroemia Lanceolata</i> Wall.	<b>benteak</b>	E
13.	<i>Michelia</i> spp.	<b>champ</b>	E
14.	<i>Phoebe</i> spp.	<b>bonsum</b>	C
15.	<i>Pinus wallichiana</i> A. B. Jacks.	<b>kail</b>	C
16.	<i>Pinus roxburghii</i> Sargent	<b>chir</b>	B
17.	<i>Pterocarpus marsupium</i> Roxb.	<b>bijasal</b>	E
18.	<i>Shorea robusta</i> Gaertn. f.	<b>sal</b>	E
19.	<i>Stereospermum</i> spp.	<b>padri</b>	—
20.	<i>Tectona grandis</i> Linn. f.	<b>teak</b>	E
21.	<i>Terminalia myriocarpa</i> Heurck et Muell. Arg.	<b>hollock</b>	A
22.	<i>Terminalia tomentosa</i> Wight et Arn.	<b>laurel</b>	B
23.	<i>Xylia xylocarpa</i> Taub.	<b>irul</b>	E

NOTE — 'A' Heartwood easily treatable.

'B' Heartwood treatable but complete penetration not always obtained.

'C' Heartwood only partially treatable.

'D' Heartwood refractory to treatment; incision necessary for 13 mm to 19 mm penetration.

'E' Heartwood very refractory to treatment; side or end penetration practically nil.

# 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

## Branch Offices :

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Gangotri Complex, 5th Floor, Bhadbhada Road, T.T. Nagar, BHOPAL 462003	55 40 21
Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
Kalai Kathir Building, 6/48-A Avanasi Road, COIMBATORE 641037	2 67 05
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Savitri Complex, 116 G. T. Road, GHAZIABAD 201001	8-71 19 96
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R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
Plot No. A-9, House No. 561/63, Sindhu Nagar, Kanpur Road, LUCKNOW 226005	5 55 07
Patliputra Industrial Estate, PATNA 800013	6 23 05
District Industries Centre Complex, Bagh-e-Ali Maidan, SRINAGAR 190011	—
T. C. No. 14/1421, University P. O., Palayam, THIRUVANANTHAPURAM 695034	6 21 04

## Inspection Offices (With Sale Point) :

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\*Sales Office Calcutta is at 5 Chowringhee Approach,  
P. O. Princep Street, CALCUTTA 27 68 00

† Sales Office is at Novelty Chambers, Grant Road, BOMBAY 89 65 28

‡ Sales Office is at Unity Building, Narasimharaja Square,  
BANGALORE 22 39 71