
Fire Resisting Construction 1989



HONG KONG

CODE OF PRACTICE FOR
FIRE RESISTING CONSTRUCTION

1989

BUILDING AUTHORITY
HONG KONG

FOREWORD

This Code of Practice has been prepared from the recommendations of the Working Party on the review of the Building (Construction) Regulations, it sets out technical details for the guidance of authorised persons, registered structural engineers and other parties concerned in the design and construction of a building. Compliance with the provisions in this Code is a primary way of satisfying the requirements for fire resisting construction under Part XIX of the Building (Construction) Regulations. This, however, is not the only way of satisfying such requirements. Other alternatives may also be acceptable if they fulfill equivalent performance.

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1. GENERAL

1.1 For the purposes of this Code of Practice the following definitions shall apply—

“basement” means any storey of a building below the lower or lowest ground storey and from which all required exit routes are in an upward direction.

“compartment” means a portion of a building which is separated from adjoining portions by walls and floors of the required standard of fire resistance assessed as a unit for the purpose of Table 2.

“compartment volume” means the space contained within the external surfaces of the walls and floors of the portion of building considered as a compartment.

“element of construction” means—

- (a) any floor, beam, column or hanger;
- (b) any load-bearing wall or load-bearing member other than a member forming the roof or part of the roof;
- (c) any required staircase including the landings and supports thereto.

“fire-resisting glazing” means glazing capable of resisting the action of fire for a period of not less than $\frac{1}{2}$ hour.

“FRP” means the period for which any element of construction, door or fire shutter is capable of resisting the action of fire when tested in accordance with BS 476: Parts 20 to 24: 1987 or as specified in the schedule.

“ground storey” has the meaning as defined in the Code of Practice on Means of Escape.

“industrial undertaking” has the meaning assigned to it in the Factories and Industrial Undertakings Ordinance.

“mean street level” has the same meaning as in B(P)R 23(1).

“places of public entertainment” has the same meaning as in the Places of Public Entertainment Ordinance.

“required staircase” means an access staircase in a firefighting and rescue stairway or a staircase required for means of escape in case of fire.

1.2 Fire shutters and fire and smoke dampers should be constructed, installed, assembled and maintained to the satisfaction of the Director of Fire Services.

2. COMPARTMENTATION

2.1 Every building should be divided into compartments by walls and floors to inhibit the spread of fire within the building such that no compartment exceeds that specified in Table 1.

2.2 Compartment walls, compartment floors, separations and lobbies should be constructed with all joints completely filled with non-combustible material to prevent the passage of smoke or flame.

Table 1. Maximum compartment volumes

Use	Maximum Compartment Volume
Bulk storage and warehouse	7 000 m ³ where the compartment floor is above basement level but not exceeding 30 m above mean street level
	3 500 m ³ where the compartment floor is at basement level or greater than 30 m above mean street level
All other uses	28 000 m ³

Any volume in excess of that given above will be dealt with on its own merits after full consideration of the equivalencies: enhanced means of escape, firefighting access, fire service installations and improved fire resistance of the structure being provided.

3. FIRE RESISTING PERIOD

- 3.1 Every element of construction within each compartment should be capable of resisting the action of fire for a period of not less than that specified in Table 2.

Table 2. Fire resisting period

Class	Use	Volume of compartment	Fire Resisting Period
1	Domestic	Not exceeding 28 000 m ³	1 hour
2	Hotel bedrooms		
3	Offices		
4	Shops, restaurant and hotel foyer	Not exceeding 7 000 m ³	1 hour
5	Places of public entertainment	Exceeding 7 000 m ³ but not exceeding 28 000 m ³	2 hours
6	Hospital		
7	Places of assembly		
8	Carparking		
9	Bulk storage and warehouse	Not exceeding 7 000 m ³	2 hours
10	Industrial undertaking except bulk storage and warehouse	Not exceeding 28 000 m ³	2 hours

Notes:— 1. Different use classes should be separated in accordance with paragraph 5.
2. Special hazards should be separated in accordance with paragraph 11.
3. For any use not covered by Table 2, fire resisting periods should be separately determined.

- 3.2 Elements of construction in any basement and the separation between the basement and any adjoining storey should have an FRP of not less than 4 hours.
- 3.3 Where a single storey building does not exceed 7 000 m³ and 7.5 m in height, any steelwork construction may be unprotected, provided that the building is separated from any adjoining building or the site boundary by a clear unobstructed open space not less than 6 m in width. Where columns and beams are in the external wall protection against corrosion may be necessary and should be separately considered.

4. PROTECTION OF ADJOINING BUILDINGS

- 4.1 Every building should be separated from any adjoining building by its own imperforate external wall having an FRP of not less than 2 hours. A building shall be regarded as adjoining another building if it is within a separating distance of 1.8 m of any building on the same site, or where it fronts a common boundary with an adjoining site, within 900 mm thereof.
- 4.2 To ensure protection against fire spread to adjoining buildings no openings should be made in such external walls that are within a distance of 900 mm of any part of any building on the same site or within 450 mm of the boundary with an adjoining site. Openings may however be made in external walls within a distance of 1.8 m of any part of any building on the same site or within 900 mm of the boundary with an adjoining site provided that these openings are protected by fixed lights with fire resisting glazing.
- 4.3 The roof of every building within a distance of 1.8 m of any part of any building on the same site or within 900mm of the boundary with an adjoining site should be constructed of material having an FRP of not less than that required for the part of the building over which it is situated.

5. SEPARATION BETWEEN USES

- 5.1 Where in any building, parts of that building are for different uses as classified in Table 2, separations should be made between them by compartment walls and floors having the longer of the FRPs specified therein in respect of such uses, but in no case less than 2 hours.

- 5.2 Small offices, caretakers quarters or small storage areas in an industrial building do not require such separation.

6. SEPARATION BETWEEN OCCUPANCIES

- 6.1 Where different occupancies are to be formed within the same use of a building, separation should be made between them by walls and floors capable of resisting the action of fire for a period of not less than that required for the elements of construction of the compartment in which it is situated, subject to a maximum of 2 hours. No such separation need be formed between such occupancies and the corridor or passage serving them.
- 6.2 This requirement includes—
- (a) domestic flats
 - (b) hotel rooms
 - (c) offices
 - (d) shop units in a shopping arcade
 - (e) factory units in an industrial building; and
 - (f) other similar situations

7. OPENINGS THROUGH COMPARTMENT WALLS AND FLOORS

- 7.1 Openings through compartment walls for communication, other than for the combination of adjoining compartments, may be permitted provided that the integrity of the wall is maintained. Such access may be through—

- (a) a lobby with doors; or
- (b) an opening protected by a fire shutter.

In the case of places of public entertainment or car parking access through a lobby with doors will be required.

- 7.2 (a) Escalators or staircases (other than required staircases) which perforate floors between compartments may be unenclosed in one compartment provided that such escalators or staircases are enclosed in the adjoining compartment by walls having an FRP of not less than the longer period required for the elements of construction of the compartments so served.
- (b) Every opening therein should be provided with a door or fire shutter having an FRP of not less than half that of the enclosing wall in which it is situated.
- 7.3 Where a ramp crosses a division between 2 compartments the opening in the compartment should be provided with a fire shutter to maintain the separation having an FRP of not less than the longer period required for the elements of construction of the compartments so served.
- 7.4 Openings may be made through compartment floors for vertical shafts subject to paragraph 8.
- 7.5 Any openings in a compartment wall or floor for the passage of air-conditioning ducts, ventilation ducts, electrical trunking, conduits, pipes and wires or holes left after construction should be protected with fire and smoke dampers or other suitable form of fire stop to maintain the required FRP of that compartment wall or floor. Where ducts, pipes, wires and any insulation passing through the compartment separation is of combustible material, such material should be contained within an enclosure having an FRP corresponding to that of the surrounding structure. Where access openings are provided to the enclosure, such openings should be provided with self-closing doors or securable covers having an FRP of not less than half that of the enclosure.

8. VERTICAL SHAFTS

- 8.1 All liftwells except for openings for doors and ventilation should be separated from the remainder of the building by walls having an FRP of not less than 2 hours.
- 8.2 A door provided at a lift landing to give access to the car of a lift and any other door to a liftwell should have an FRP of not less than 1 hour with respect to integrity, and where required by BS 5655: Part 1 paragraph 7.2.2.3, also with respect to insulation.
- 8.3 All required staircases and any lobbies separating those staircases from the general accommodation should—
- (a) be separated from the remainder of the building by walls having an FRP of not less than that required for the elements of construction of the compartment to which they connect;
 - (b) be imperforate, except for any doorway giving access to the building which should be provided with a door having an FRP of not less than half that of the wall in which the doorway is situated, or 1 hour whichever is less.
 - (c) not accommodate any services other than emergency services such as fire hydrants, sprinkler systems, emergency lights and exit signs.

- 8.4 Each element of construction of a required staircase should have an FRP of not less than the period required for the element of construction of the compartment to which the staircase connects and if connecting 2 compartments the longer period.

9. PROTECTION AGAINST SPREAD OF FIRE BETWEEN FLOORS

- 9.1 To prevent the spread of smoke or flame between floors through openings the following precautions should be taken.
- 9.2 At any internal unprotected opening such as at escalators, circulation staircases or walkways in an atrium, a barrier of not less than 450 mm measured vertically downwards from the underside of the floor, should be provided to surround the opening. The barrier should be constructed of material having an FRP of not less than 1 hour. Floor openings tend to create vertical or horizontal drafts which permit the spread of fire. Consequently the barrier around such openings should act to properly stop the heated air and permit the control of fire at any point by local sprinklers. It is important therefore that if false ceilings are hung in the vicinity of the opening that the barrier extends not less than 450 mm below the false ceiling. See Fig. 1 and 2.
- 9.3 A glass curtain wall or other similar construction which protects the building against the elements and which extends beyond one storey in height should be constructed entirely of non-combustible materials. To prevent the passage of smoke or flame any void formed between the external wall and the curtain wall should be solidly infilled at each floor level by non-combustible material having an FRP of not less than that required for the floor.

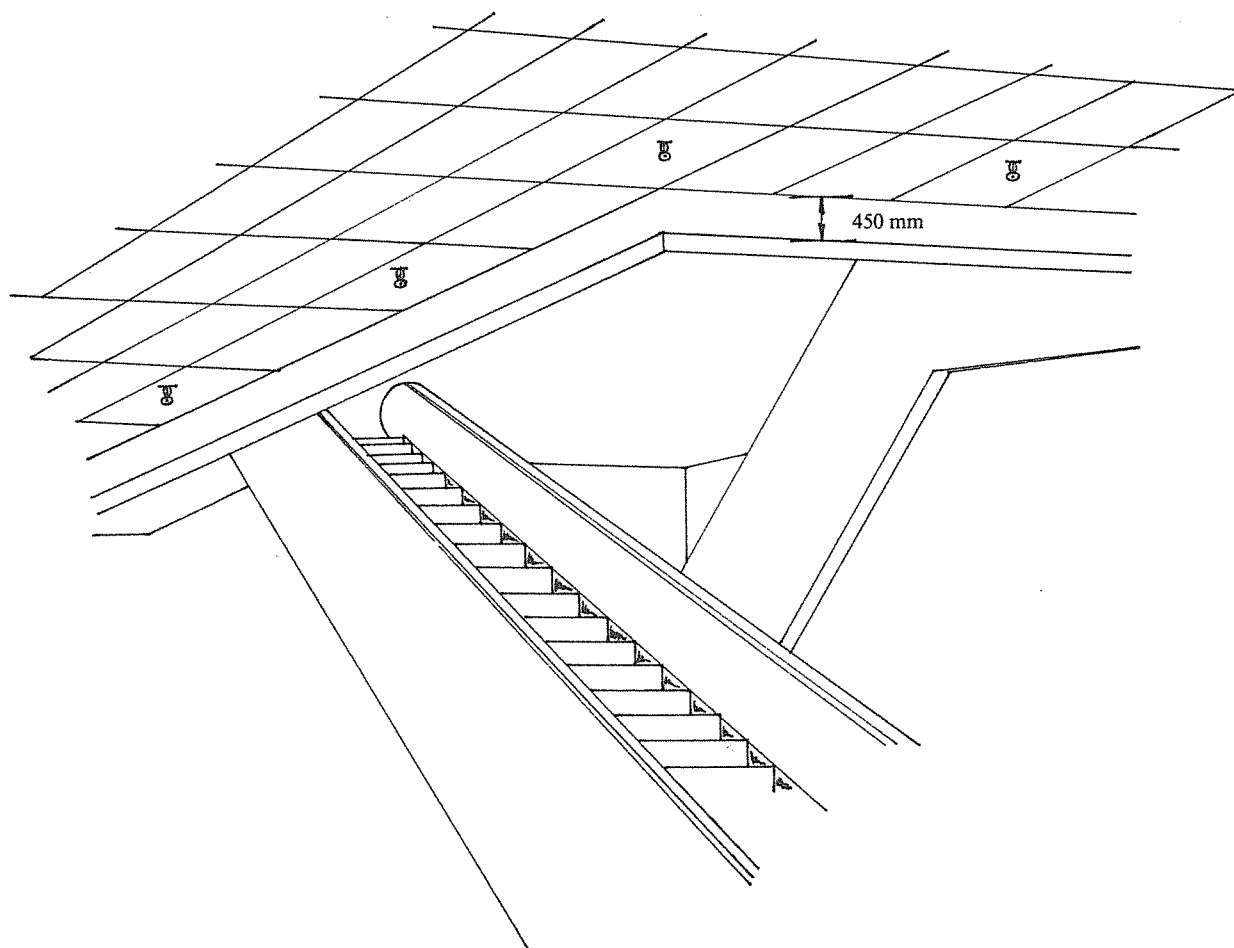


Fig. 1 Vertical barrier at escalator

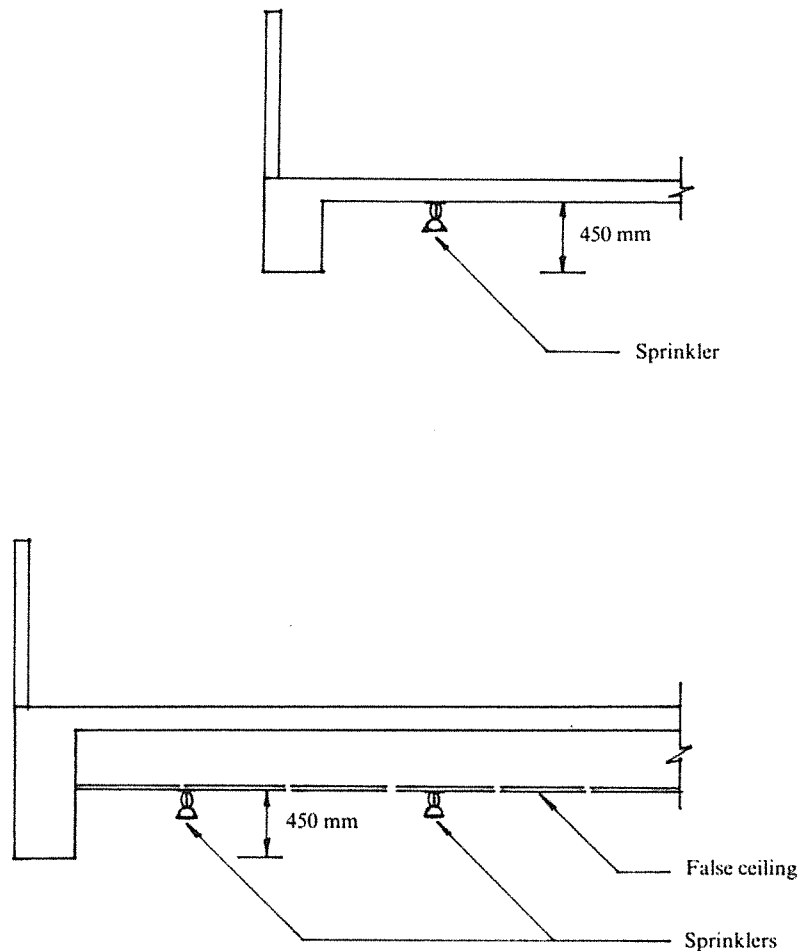


Fig. 2 Vertical barrier at Atrium

10. ROOFS

All roofs, together with the members forming the roof structure, should be constructed of non-combustible materials.

11. SPECIAL HAZARDS

- 11.1 High voltage electrical switch gear, transformers, fire service pumps, air handling unit plant, air-conditioning plant, lift machines, rooms housing escalator machines, flammable liquid spraying rooms, boilers, areas for storing and/or charging batteries and areas for storing dangerous goods should be enclosed by non-combustible construction having an FRP of not less than 2 hours, 4 hours adjoining required stairs, and any permitted openings thereto should be provided with a door having an FRP of not less than one hour.
- 11.2 A kitchen attached to a restaurant should be—
 - (a) enclosed by non-combustible construction having an FRP of not less than 1 hour and openings should be provided with doors having an FRP of not less than $\frac{1}{2}$ hour;
 - (b) provided with protected lobbies between each door and any escape route from the main building.
- 11.3 Other areas of high fire risk directly associated with a normal occupancy in a building should be adequately separated by fire resisting construction.

12. BASEMENTS

- 12.1 Where a basement is to be used in conjunction with the ground storey for the same use it may be united thereto provided that the FRP of the basement is continued to the upper floor and the construction separating that floor from any adjoining storey.

- 12.2 Every basement should be provided with smoke outlets that are—
- (a) not more than 30 m apart, along the street frontages or adjacent to external walls;
 - (b) sited at high level and be so arranged that a through draught can be created;
 - (c) in aggregate form not less than 0.5 per cent of the floor area they serve and in areas used for bulk storage or warehouse not less than 2.5 per cent of the floor area they serve;
 - (d) not less than 1 m in its least dimension;
 - (e) situated as far away as possible from the points of discharge of all required staircases and be suitably indicated on the external face of the building;
 - (f) covered by stall-boards or pavement lights that can be easily broken by firemen in an emergency; and
 - (g) where terminating in the open air in a position inaccessible to a fireman maintained unobstructed or covered only with a grill or louvres constructed of metal other than aluminium.
- 12.3 Where a dynamic smoke extraction system to the satisfaction of the Director of Fire Services is provided to the basement the smoke outlet requirements of paragraph 12.2 may be reduced as follows:—
- (a) provide at least one smoke outlet for every 3 500 m³ of compartment volume, but in no case less than 1 outlet per floor;
 - (b) the outlet to be readily accessible to fire-fighters in an emergency.
- 12.4 Where a smoke outlet shaft serving a basement extends into or through other storeys it should be enclosed by construction having the same FRP as that required for the storey served or through which it passes whichever is the longer, and where a smoke outlet shaft serving a basement adjoins another smoke outlet shaft they should be similarly separated from each other.

13. BRIDGES AND TUNNELS

- 13.1 A bridge uniting buildings should be provided at each end with a fire shutter having an FRP of not less than 2 hours and no openings should be provided in either building within a distance of 900 mm from the junction of the bridge with either building and the walls of the buildings within this distance should be of non-combustible construction having an FRP of not less than 2 hours.
- 13.2 Paragraph 13.1 does not apply to a bridge that—
- (a) is constructed wholly of non-combustible material; and
 - (b) is provided at the sides only with a handrail or parapet not exceeding 1.2 m in height.
- 13.3 Tunnels uniting buildings should be provided at each end with a fire shutter having an FRP of not less than 4 hours.

14. DOORS

- 14.1 All doors required to have an FRP should be arranged to be self-closing.
- 14.2 A notice should be provided on both sides of such doors in English and Chinese in letters and characters not less than 10 mm high as follows—

FIRE DOOR TO BE KEPT CLOSED

防 火 門
應 常 關

- 14.3 All such doors shall be closely fitted around their edges to impede the passage of smoke or flame.
- 14.4 Doors including frames should be tested in accordance with BS 476: Parts 20 and 22: 1987 and certified as being capable of resisting the action of fire for the specified period.

SCHEDULE

The schedule lists the minimum standard of construction and building materials capable of resisting the action of fire for specified periods.

If however, proprietary products are used instead, these products should be tested in accordance with BS 476: Parts 20 to 24: 1987 and certified as being capable of resisting the action of fire for specified periods.

1. In this Schedule—

“gypsum plaster” means gypsum building plaster complying with BS 1191;

“gypsum plaster board” means gypsum plaster board complying with BS 1230.

TABLE A
WALLS AND PARTITIONS OF NON-COMBUSTIBLE CONSTRUCTION

Construction and Materials	Minimum thickness in mm (excluding plaster) for period of		
	4 hrs.	2 hrs.	1 hr.
SOLID CONSTRUCTION			
Solid bricks of clay, concrete or sand lime without plaster	225	225*	100
Reinforced concrete—			
(a) containing not less than 1 per cent of vertical reinforcement	180	100	75
Concrete cover to main reinforcement	25	25	15
(b) containing less than 1 per cent of vertical reinforcement	240	160	120
Concrete cover to main reinforcement	25	25	25
HOLLOW BLOCK CONSTRUCTION			
Clay blocks (outer web not less than 13 mm thick) of 2 cells not less than 50 per cent solid finished with 13 mm gypsum plaster on each side		100	100
Concrete blocks of one cell in wall thickness not less than 50 per cent solid finished with 13 mm gypsum plaster on each side			190

* Where finished with 13 mm gypsum plaster on each side, the thickness may be reduced to 100 mm.

TABLE B
PARTITIONS NOT CONSTRUCTED
WHOLLY OF NON-COMBUSTIBLE MATERIALS

Construction and Materials	Minimum thickness of finish in mm on each face for a fire resistance of	
	2 hrs.	1 hr.
SOLID CONSTRUCTION		
Wood wool slabs—		
(a) 50 mm minimum thickness with gypsum plaster finish		13
(b) 75 mm minimum thickness with gypsum plaster finish	13	6
Gypsum plaster board in cores not less than 19 mm thick in sections not more than 1.2 m wide supported top, bottom and sides in steel channels or a timber framework, with gypsum plaster finish		10
HOLLOW CONSTRUCTION		
Steel or timber framing with facings on each side of—		
(a) Portland cement plaster, Portland cement-lime plaster or gypsum plaster on metal lathing		19
(b) 2 layers of 10 mm thick gypsum plaster board with gypsum plaster finish		Nil
(c) 13 mm thick gypsum plaster board with gypsum plaster finish		6
(d) 19 mm thick gypsum plaster board with gypsum plaster finish		Nil

Note:—In this Table “Wood wool slabs” means wood wool slabs complying with BS 1105

TABLE C
FLOORS AND LANDINGS

Construction and Materials	Minimum thickness in mm for period of		
	4 hrs	2 hrs	1 hr
SOLID REINFORCED CONCRETE CONSTRUCTION			
Thickness of concrete	170	125	100
Concrete cover to all reinforcement—			
simply supported	55*	35	20
continuous	45*	25	20
SOLID PRESTRESSED CONCRETE CONSTRUCTION			
Depth including screed	170	125	100
Concrete cover to all steel—			
simply supported	65*	40	25
continuous	55*	35	20

* Reinforcement consisting of expanded metal lath or a wire fabric not lighter than 0.5 kg/m² with 2 mm diameter wire at not more than 100 mm centres or a continuous arrangement of links at not more than 200 mm centres shall be incorporated in the concrete cover at a distance not exceeding 20 mm from the face.

TABLE D
STEEL COLUMNS AND BEAMS

Construction and Materials	Minimum thickness of protection in mm for period of		
	4 hrs	2 hrs	1 hr
SOLID PROTECTION			
Columns and hangers (mass per metre not less than 45 kg)			
(a) Concrete not inferior to Grade 20 and reinforced in accordance with the Code of Practice for the Structural Use of Steel	75	50	50
(b) Solid bricks of clay, concrete or sand lime	75	50	50
Beams (mass per metre not less than 30 kg)			
Concrete not inferior to Grade 20 and reinforced in accordance with the Code of Practice for the Structural Use of Steel	75	50	50
HOLLOW PROTECTION			
Columns and hangers (mass per metre not less than 45 kg)			
(a) Solid bricks of clay, concrete or sand lime reinforced in every horizontal joint with steel binding wire not less than 2.5 mm in thickness or steel mesh weighing not less than 0.5 kg/m ²	115	50	50
(b) Portland cement plaster, Portland cement-lime plaster or gypsum plaster on metal lathing			19
(c) Gypsum plaster on 10 mm gypsum plaster board with 1.6 mm diameter wire binding at 100 mm pitch			13
(d) Gypsum plaster on 19 mm gypsum plaster board with 1.6 mm diameter wire binding at 100 mm pitch		13	7
Beams (mass per metre not less than 30 kg)			
(a) Portland cement plaster, Portland cement-lime plaster on metal lathing			19
(b) Gypsum plaster on metal lathing		22	16
(c) Gypsum plaster on 10 mm gypsum plaster board with 1.6 mm diameter wire binding 100 mm pitch			13
(d) Gypsum plaster on 19 mm gypsum plaster board with 1.6 mm diameter wire binding at 100 mm pitch		13	7

Note:— In this Table—

“hollow protection” means that there is a void between the protective material and the web of the steel section and such hollow protection to columns shall be effectively sealed at each floor level;

“solid protection” means casing which is bedded close to the steel without any intervening cavities and with all joints in that casing made full and solid.

TABLE E
REINFORCED CONCRETE COLUMNS AND BEAMS

Construction and Materials	Minimum overall size of column in mm for period of		
	4 hrs.	2 hrs.	1 hr.
REINFORCED CONCRETE COLUMNS AND HANGERS			
(a) Fully exposed columns and hangers	450	300	200
Concrete cover to main reinforcement	35	35	25
(b) 50 per cent exposed of columns and hangers	350	200	160
Concrete cover to main reinforcement	35	25	25
(c) One face exposed of columns and hangers	240	160	120
Concrete cover to main reinforcement	25	25	25
REINFORCED CONCRETE BEAMS			
Width of beam	280	200	200
Concrete cover to main reinforcement—			
simply supported	80*	50	30
continuous	60*	40	30
PRESTRESSED CONCRETE BEAMS			
Width of beam	280	200	200
Concrete cover to tendons—			
simply supported	90*	70*	30

* Reinforcement consisting of expanded metal lath or a wire fabric not lighter than 0.5 kg/m² with 2 mm diameter wire at not more than 100 mm centres or a continuous arrangement of links at not more than 200 mm centres shall be incorporated in the concrete cover at a distance not exceeding 20 mm from the face.

TABLE F
STAIRS

Construction and Materials	Minimum thickness in mm for period of		
	4 hrs	2 hrs	1 hr
Reinforced concrete construction—			
Thickness at waist of slab	170	125	95
Concrete cover to all reinforcement	55*	35	20

* Reinforcement consisting of expanded metal lath or a wire fabric not lighter than 0.5 kg/m² with 2 mm diameter wire at not more than 100 mm centres or a continuous arrangement of links at not more than 200 mm centres shall be incorporated in the concrete cover at a distance not exceeding 20 mm from the face.

TABLE G
GLAZING

Construction and Materials	Minimum thickness of glazing in mm for period of	
	1 hrs	$\frac{1}{2}$ hr
1. Glass in direct combination with steel in squares not exceeding 0.015m ² in area		6
2. Glass reinforced with wire not less than 0.5 mm in diameter laid to a square mesh measuring 12.5 mm from centre to centre of wire and electrically welded at the intersections or laid to a hexagonal mesh measuring 22 mm across the flat sides		6
Glass complying with paragraph 1 or 2 of this Table, in windows, should be fixed with timber or metal beads or with a glazing compound in conjunction with clips in panels not exceeding 0.4 m ² in area in steel frames (fixed shut) or, in timber frames (fixed shut) having a minimum thickness of 45 mm		