

F.R. Note No 264/1956

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE  
JOINT FIRE RESEARCH ORGANIZATION

This report has not been published and should be considered as confidential advance information. No reference should be made to it in any publication without the written consent of the Director, Fire Research Station, Boreham Wood, Herts. (Telephone: 21Stree 1341 and 1777).

## REVIEW OF REGULATIONS FOR PROTECTION AGAINST FIRES IN HIGH BUILDINGS

by

L. A. Ashton

Summary

A comparison is made of the recommendations and requirements of various authorities in the United Kingdom for fire protection in high buildings as far as this affects personal safety.

File No. F.1600/17/14

September, 1956.

Fire Research Station,  
Boreham Wood,  
Herts.

## REVIEW OF REGULATIONS FOR PROTECTION AGAINST FIRES IN HIGH BUILDINGS

L. A. Ashton

### Introduction

In the United Kingdom requirements for fire precautions in buildings generally are contained in the Bye-laws of the London County Council, in the Model Bye-laws of the Ministry of Housing and Local Government, and the Model Building Bye-laws of the Department of Health for Scotland. Recommendations, which are intended to serve as a basis for building codes and regulations, have been made in the reports of the Committee on the Fire Grading of Buildings (1).

All local authorities throughout the United Kingdom have powers under various Acts of Parliament to control the design and construction of buildings in relation to fire protection. These Acts empower them to require adequate means of escape in all classes of building, but there is no commonly agreed code applicable throughout the country. Detailed provisions are contained in the Model Bye-laws issued by the Department of Health for Scotland for the guidance of Scottish local authorities in preparing their building Bye-laws, and the London County Council issues a Code of Practice for guidance of applicants in the preparation of proposals to be submitted to the Council for approval. The recommendations on personal safety in the event of fire in buildings made by the Fire Grading of Buildings Committee are contained in Part III of their second report.

This note compares some of the main factors governing means of escape in these three documents in so far as they apply to especially high buildings.

### Definitions

It is necessary at the outset to define an "especially high building". In the British regulations buildings are grouped for the purpose of fire precautions approximately as follows: (1) those with no floor at a greater height than 42 ft. above the pavement. (2) those having one or more floors above 42 ft. but not above 67 ft. (3) those with floors at heights greater than 67 ft. (The height of 42 ft. to the topmost floor level is based on the 50 ft. escape ladder working at the most convenient angle so that rescue would normally be possible through the windows of the topmost storey.) The definition of an especially high building is therefore taken for the purpose of this note as one having floors at a greater height than 67 ft., that is a building of height exceeding 75 ft., and the note deals with the precautions relating to personal safety in such buildings.

### Scope of the provisions

There are many factors which affect the design and construction of buildings when personal safety in cases of fire is taken into account and some of these factors are common to buildings of a given class or occupancy irrespective of height. Recommendations tend to be more detailed and wider in scope than mandatory regulations.

A comprehensive code of fire precautions for high buildings should include regulations for dealing with the aspects enumerated below:-

- 1) Minimizing spread of flame on walls and ceilings of escape routes.
- 2) Minimizing spread of smoke and hot gases.
- 3) Minimizing growth of fire by:
  - (a) control of internal linings
  - (b) subdivision or limitation of size of building
  - (c) specifying fire resistance for elements of structure.
- 4) Limitation of use of combustible materials in construction.
- 5) Number and location of exits.
- 6) Travel distance to an exit or protected point.
- 7) Number of staircases and exit width.
- 8) Staircase enclosure and construction.
- 9) Requirements for corridors and escape routes.
- 10) Installation of doors for escape routes.
- 11) Lighting of staircases and exits.
- 12) Maintenance.

The Model Byelaws of the Ministry of Housing and Local Government have requirements only under heading 3 (b) and (c), which, however, are not basically for means of escape. These specify that for a given class of building the fire resistance required for the various elements of structure (including staircase enclosures but excluding external walls) depends on the height of the building among other factors. For domestic buildings the fire resistance specified is  $\frac{1}{2}$  hour for heights exceeding two storeys but not exceeding 50 ft. in height and 1 hour for heights exceeding 50 ft. For all other classes of building the fire resistance required in a given class of building where the height exceeds 75 ft. is double that required for a building of the same class with a height between 50 and 75 ft. It can be assumed that buildings of heights of 50 and 75 ft. have their topmost floors 42 and 67 ft. respectively above the pavement.

The attached table enables a comparison to be made between the requirements of the London County Council, the Department of Health for Scotland, and the recommendations of the Fire Grading of Buildings Committee, for personal safety in case of fire under each of the headings given above.

The information in the Table is not exhaustive but outlines those provisions which primarily affect means of escape.

- (1) Post-War Building Studies No. 20: Fire Grading of Buildings: Part I, General Principles and Structural Precautions. Post-War Building Studies No. 29: Fire Grading of Buildings: Part II, Fire Fighting Equipment: Part III, Personal Safety: Part IV, Chimneys and Flues.

## Provisions made by various authorities for per

Object	London County Council	
1) Minimizing spread of flame on walls and ceilings of escape routes	No wood or other inflammable linings permitting a rapid spread of flame to be used in protected enclosures of a staircase forming only means of escape from a building. No cavities allowed behind linings.	Cor eil in
2) Minimizing spread of smoke and hot gases.	Staircases, landings, corridors etc. to be enclosed and ceiled to give fire resistance not less than $\frac{1}{2}$ hour. Doors to be self-closing and have fire resistance of not less than $\frac{1}{2}$ hour.	Sta wal ope acc
3) Minimizing growth of fire (a) internal linings generally (b) Subdivision and limitation of size of building (c) fire resistance	None  For all types of building of whatever height the fire resistance specified for elements of construction depends on the use of the building and the cubical extent or floor area on any one floor.	For 75 the for 75
4) Limitation of use of combustible materials in construction	Elements of construction required to resist fire for not less than 1 hour to be of noncombustible materials.	Ext to flo sta acc
5) Number and location of exits	In general two staircases, the number depending on number of persons accommodated and minimum width of each staircase. Staircases should be remote from each other, but not more than 180 ft. apart.	Min rec num ser cap be
6) Travel distance	The distance to a staircase in any isolated portion should not exceed 90 ft.	In cor 150 als In
7) Staircase and exit width	Minimum width of staircases and exits 3 ft. Actual width depends on calculated number of people accommodated. Staircases exceeding 6 ft. in width to be divided by central handrail into two portions each not less than 3 ft. 6 in. wide.	Min Act ser ove 6 max 3 ove Min to (

Personal safety in especially high buildings

Department of Health for Scotland	Fire Grading of Buildings Committee
Corridor linings (wall and ceiling) to be either non-combustible or inherently Class 1 in the spread of flame test of B.S. 476.	All surface finishes on walls, ceilings and soffits of stairs or escape routes should be non-combustible.
Stairways to be enclosed by fire resisting walls of non-combustible materials with any openings in them protected with self-closing smoke-stop doors.	Enclosure of staircases by fire resisting walls with openings protected by self-closing doors; openings and extraction devices specifically for smoke venting not recommended.
None  For all classes of building of height over 5 ft. the fire resistance requirements for the elements of construction are double those for buildings of heights between 50 and 55 ft.	Recommendations for surface spread of flame classification for internal linings in different types of building.  Buildings over 75 ft. in height to be of non-combustible construction with fire resistance, floor area and cubic capacity depending on occupancy and fire load. Sprinklers recommended for certain occupancies where floor area exceeds 10,000 ft <sup>2</sup> in any compartment.
External, separating and fire division walls to be of noncombustible materials. Stairs, floors of landings, and corridors within staircase enclosures, balconies used for access to be of non-combustible material.	See 3 (b, c).
Minimum of two staircases. Actual number required depends on type of construction, number of storeys above ground storey served by the stairways and the total capacity of these storeys. Exits must be independent.	All buildings to be provided with at least two staircases or exits. The factors affecting number of additional staircases are:- number of storeys above ground storey, calculated number of people in building above ground floor, occupancy, minimum width of each staircase and whether building is sprinklered or not.  Exits to be as widely separated as possible.
In buildings of non-combustible construction travel distance must not exceed 50 ft. of which not more than 100 ft. is along a corridor when escape is possible in more than one direction.	Travel distance 150 ft. of which not more than 100 ft. should be along a corridor. When escape is from a dead-end area these figures should be reduced to 100 ft. and 60 ft. respectively.
Minimum width of stairs 2 ft. 6 in. Actual width depends on number of storeys served and number of people distributed over all the floors. If width exceeds 6 ft. central handrail to be provided making 2 sections each not less than 3 ft. 6 in. wide.  Every exit from any storey of any block of flats to have minimum clear width according to capacity of storey and number of exits (minimum 2 ft. 6 in.).	Minimum width of staircases 2 ft. 6 in. Actual width is determined by number of staircases, number of storeys served and calculated number of people distributed over all floors. Staircases exceeding 6 ft. in width should be divided into two portions by centre hand rail each not less than 3 ft. 6 in. nor more than 6 ft. wide. Recommendations are also made for width of exits based on same considerations.

Object	London County Council
3) Staircase enclosure and construction.	Staircase enclosures to be of solid noncombustible material giving not less than 1 hour fire resistance and continuous through floors or to extend from floor to ceiling. Staircases should generally be against outer wall and be lighted and ventilated by windows. Doors to enclosures to be solid timber not less than 1 1/2 in. thick and to be self-closing. Staircases of non-combustible material. Dimensions of treads and risers specified. Staircases to have straight flights with not more than 15 steps and provided with handrails and landing spaces.
4) Corridors and escape routes.	Clear passages to be kept on all floors up to and between staircases, passways and exits, which are to be kept free of obstructions and litter. Partitions and high fittings should not be erected without consent of Council.
5) Doors, general for escape routes.	Doors to open in direction of exit or both ways and to be self-closing. Sliding doors permitted but not revolving doors.
6) Lighting of staircases and exits.	Adequate artificial lighting should be provided to internal staircases and exits.
7) Maintenance.	Periodical examination to be made by owners of condition of means of escape and all safeguards to prevent spread of fire to ensure they are in good condition and repair and in efficient working order.

Department of Health for Scotland	Fire Grading of Buildings Committee
<p>Enclosures of staircases to be by walls of noncombustible materials having fire resistance of not less than 30 minutes and to be continuous for full height. Openings in walls to be protected with self-closing smoke-stop doors. Enclosures shall give access at ground level to exit to open air. Stairs to be in straight flights of not less than 2 nor more than 15 steps. Handrails to be provided. Size of treads and risers specified.</p>	<p>All internal staircases should be enclosed. Fire resistance of enclosure need not be more than <math>\frac{1}{2}</math> hour if escape is only factor. Hollow combustible construction should not be used. Special precautions necessary at floor junctions. Doors and glazing in enclosure to have similar fire resistance. Staircases preferably should adjoin external wall and be lighted and ventilated by windows. Stairs should be noncombustible and have minimum fire resistance of <math>\frac{1}{2}</math> hour.</p>
<p>Corridors forming part of travel distance and every room forming part of travel distance from any other room to have all continuous wall and ceiling linings either non-combustible or inherently Class 1 in spread of flame test.</p>	<p>Glazing in partitions bounding corridors to be fire resisting. Open flame lights should be avoided. Fire resistance of partitions should be at least <math>\frac{1}{2}</math> hour and surface finishes non-combustible.</p>
<p>Doors to open in direction of exit or both ways. Sliding doors permitted. Self-closing smoke-stop doors to be not less than <math>\frac{1}{2}</math> in. thick.</p>	<p>Doors to open in direction of exit travel or both ways and be self-closing. Sliding doors permitted.</p>
<p>None</p>	<p>Adequate artificial lighting should be provided to all staircases and exits.</p>
<p>Byelaws cannot deal with maintenance but it is required in accordance to the Model that stairways, exits and escape routes must be maintained in good repair and kept free of obstruction if they are to be effective when needed.</p>	<p>Regular inspection of doors, passages and staircases to be made. Corridors not to be obstructed by storage or litter. Doors, hinges, fastenings etc. to have regular attention.</p>