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7

FIRE AND THE DESIGN OF SCHOOLS

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FIRE AND THE DESIGN OF SCHOOLS

(Revision January 1971)

INTRODUCTION

1. Regulation 51 of the Standards for School Premises Regulations, 1959,[1] as amended, deals with fire precautions in schools and reads:

> "In all parts of the buildings of every school and of all boarding accommodation, the design, the construction, the limitation of surface flame spread, the fire resistance of the elements of the structure and the properties of the materials shall be such that the health and safety of the occupants, and in particular their safe escape in the event of fire, shall be reasonably assured."

This BULLETIN seeks to give guidance on ways of designing schools so that they will satisfy the requirements of this regulation. This guidance is limited in scope in two ways:

(1) It is concerned almost entirely with primary and secondary day schools; it is not concerned with residential accommodation of any kind; in part, however, it will be found to apply to certain non-residential buildings other than primary and secondary schools, such as establishments of further education and colleges of education. Buildings for handicapped children require special consideration depending on the handicap concerned.

(2) It applies, in the main, only to new buildings, but opportunities may arise, as, for example, when the re-equipment of existing fire-fighting and fire-warning systems is essential, to carry out the new work in accordance with the guidance offered on these points.

It should be noted that some parts of large school buildings which are used as offices or shops may also be subject, as regards the means of escape, to the Offices, Shops & Railway Premises Act 1963. In these cases, H.M. Factory Inspectorate should be brought into any discussions concerning means of escape and fire alarms, though their requirements are unlikely to differ greatly from the general guidance in this BULLETIN.

2. Although the main emphasis of the BULLETIN is on those precautions judged to be sufficient to ensure the safe escape of the occupants of the building in the event of fire, rather than on any which may be necessary to preserve its structure or fabric, additional precautions that may reasonably be taken to restrict damage to the structure are mentioned briefly in Appendix 1. The attention of School Authorities is particularly drawn to the information about the number of fires in educational buildings of all kinds during the years 1958 and 1963-68 contained in Appendix 2.

3. This fourth edition of the BULLETIN has been revised in a Metric version and in the light of experience and suggestions from local education and fire authorities since 1961. It takes account of the growing trend towards larger and more interconnected spaces in the design of schools and their attendant special requirements

[1] Statutory Instrument 1959, No. 890, H.M.S.O. 10p (2s. 0d.), and Statutory Instrument 1969 No. 433 (Middle Schools and Minor Amendments) Regulations 1969: H.M.S.O. 4p (9d.).

with regard toescape routes. The standards which have been recommended for these plans follow those previously recommended where dual-purpose areas were involved and now also include the maximum distances from the doors of individual rooms. The problems caused when rooms and other spaces do not have conventional opening windows are also mentioned. It also considers new building materials, including a revised spread-of-flame table for lining materials, and methods of construction coming into general use. Reference is made to current Codes of Practice where applicable. Wherever possible, the recommendations contained within this edition of the BULLETIN have been brought into line with the requirements contained in Part E and its Schedules of the Building Regulations 1965. Future problems which may arise as a result of developments of new building techniques, etc., will be considered, and amendments published as necessary.

4. The formulation of systematic principles to serve as a guide in individual cases presents special difficulties. Any such principles, to be of general use, must hold good for a wide range of designs, materials and methods ofconstruction. In particular, taking into account the present trends of school design and construction, they must remain valid, not only for traditional building methods and designs, but also for new, including industrialized, systems of construction and for designs which are becoming less formal by the breaking down of rigid divisions between one space and another and the planning of dual and multiple use of single spaces. The precautions recommended attempt to embrace all these varying conditions. The recommendations as a whole have been specifically framed to permit the maximum freedom in planning and construction compatible with ensuring personal safety.

5. To satisfy the requirement that " . . . safe escape (of the occupants) in the event of fire shall be reasonably assured . . . " the proper design and construction of the escape routes are, of course, matters of major importance. Even when adequate means of escape have been provided, however, the construction of the building as a whole cannot be ignored; it must not encourage the rapid spread of fire but must resist it until everyone has escaped, and allow a margin for unforeseen circumstances. Further, in order to ensure the early evacuation of the building in case of fire, the provision of a fire-warning system is necessary and, as the early extinction of fire will minimize personal hazard, the provision of fire-fighting facilities is also necessary. It may be thought that structural precautions can be balanced against the provision of means of escape, fire-warning systems, and fire-fighting equipment. This might be possible within narrow limits, but the characteristics of fire make it necessary to adopt a minimum standard in each of these categories, and these are dealt with separately in the BULLETIN, as follows:

(1) Part I, which serves as a general introduction to the subject of means of escape from a burning building, describes the behaviour of fire insofar as it may affect those parts of the building which people must necessarily use to reach safety.

(2) Part II makes detailed recommendations about the planning and construction of these escape routes and is based very largely on the considerations discussed in Part I. These recommendations deal chiefly with the number, width, location and construction of escape routes.

(3) Part III deals with the structural precautions necessary in addition to those in Part II to ensure personal safety. Precautions, which vary in degree largely according to the height of the building, turn on two critical factors; (i) the use of combustible materials both as wall and ceiling linings and in the structure of the building, and (ii) the fire resistance of elements of structure.

(4) Part IV describes various types of fire-warning systems and suggests the scale on which they might be installed.

(5) Part V deals similarly with fire-fighting equipment.

(6) Part VI briefly calls attention to some everyday precautions by the occupants which, if not observed, may well nullify all the precautions recommended elsewhere.

Acknowledgments

6. The preparation of the original BULLETIN and this revision would not have been possible without the active co-operation of persons outside the Department of Education and Science. The Secretary of State wishes to acknowledge all the assistance given, particularly that by the Fire Department and Fire Service Inspectorate of the Home Office, the Building Regulations Division of the Department of the Environment, the Factory Inspectorate of the Department of Employment, the Fire Research Station and the Greater London Council. Thanks are also due to those in local education and fire authorities who at various times have helped to improve this BULLETIN during the 20 years since it was first published.

TERMINOLOGY

Escape route

7. The term *escape route* means a route from a point in a building to a final exit. Escape routes must not terminate in enclosed courtyards, from which it would be necessary to re-enter the buildings before reaching complete safety. Escape routes may comprise one or more of the following constituent parts: room exit doors: horizontal circulation areas (defined in paragraph 10 below) and the exits from them; and stairways and their exits. For example, a single external door may be an adequate escape route from a room on the ground floor. More generally, however, in addition to a room exit door, an escape route will include a portion of horizontal circulation area and, from upper floors, a stairway.

Final exit

8. The term *final exit* means the terminal point of an escape route beyond which persons are no longer in danger. This would normally be an unenclosed space in the open air at ground level.

Dual-purpose area

9. The term *dual-purpose area* is used to mean any area which may serve at least two different purposes, one of which is that of an escape route. For instance, dual-purpose areas may frequently feature in 'open-plan' schools.

Horizontal circulation area

10. The term *horizontal circulation area* is used to include both corridors and dual-purpose areas as defined in paragraph 9 above.

Area of high fire risk

11. The term *area of high fire risk* is used to mean any room or space in which, on account of its use, an outbreak of fire is more likely to occur than in a non-specialist teaching room. Boiler rooms, kitchens, laboratories, workshops and any craft or practical room with a portable heating or heat-producing appliance are among the rooms which should be reckoned as being of high fire risk.

Stairway enclosure

12. The term *stairway enclosure* means either (i) the walls or partitions surrounding a stairway or any part of a horizontal circulation area that is not separated from the stairway by doors; or (ii) the space so enclosed.

Combustibility and fire resistance

13. The terms *combustibility* and *fire resistance*, and their derivatives, are used as defined in B.S. 476,[2] which indicates that 'combustibility' applies only to materials, and that 'fire resistance' applies only to elements of structure.

Lining materials

14. *Lining material* means a material incorporated in a building structure to form the surface of a wall or ceiling. The

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[2]B.S. 476: Parts 3–8.
Part 3: *External fire exposure roof tests.*
Part 4: *Non-combustibility test for materials.*
Part 5: *Ignitability test for materials.*
Part 6: *Fire propagation test for materials.*
Part 7: *Surface spread of flame test for materials.*
Part 8: *Fire resistance tests for elements of building construction.*
(British Standards Institution, London, N1 9ND).

surfaces of combustible lining materials are classified into one of four classes by a surface spread of flame test specified in B.S.476. Class 1 surfaces are the safest so far as the spread of flame is concerned and Class 4 the most hazardous. Lining materials can also be non-combustible or Class 0, both of which are safer than Class 1, being either completely non-combustible or not contributing significantly to the spread of flame. Class 0 is defined in Regulation E14 of the Building Regulations 1965 or subsequent amendment. Where Class 0 is recommended in this edition of the BULLETIN a material which is inherently Class 1 may be used. To achieve 'inherent Class 1' all treatment must be part of the process of manufacture and all surfaces and cut edges of the material must achieve Class 1.

Roof coverings

15. This term is used to mean either the roof covering by itself or in combination with other materials or other parts of the roof structure if these are necessary to improve the properties of the roof covering proper in retarding the penetration of fire from outside a building. Roof coverings are designated in accordance with standard tests specified in B.S. 476, Part 3[3]. The designation of some common roof coverings is referred to in Appendix 5.

Structural steelwork of heavy section

16. This means solid hot-rolled steel joists weighing at least 18 lb per foot run, or solid hot-rolled steel channel or angle sections formed into a box-shaped section with two members continuously welded at both edges and weighing at least 30 lb per foot run.

[3]B.S. 476, Part 3 (1958), *External fire exposure roof tests.* (Under revision.) British Standards Institution.

Fire doors

17. Fire-resistant and smoke-stop doors are referred to in this BULLETIN under the general title of fire doors. They are one of the most important links in the chain of fire safety precautions and care in their selection to ensure that they are adequate for their purpose cannot be over-emphasized. The failure of doors under fire usually occurs either at the point between the door and the frame or at one or more of the points where ironmongery is fixed—particularly at the hinges and lock positions. Doors used for fire purposes should be self-closing and marked with a warning notice that they are provided for fire safety. When possible fire doors should be kept closed. (Further reference to this problem is made in paragraphs 85-89.) For the purpose of this BULLETIN the fire doors recommended are referred to as types 1 and 2 and are as described in B.S. Code of Practice CP3: Chapter IV: Parts 2 and 3 (1968). In all cases the tests referred to are those laid down in B.S. 476 for doors. The fire-resistance test for doors does not specify a minimum period of heat insulation.

18. *Type 1 door.* This door has generally been referred to as fire resistant and is intended for use in openings in compartment walls (Appendix 1 para 4), openings in staircase enclosures and internal access to boiler rooms (para 55). The door should satisfy the requirements of test when fitted in its frame as to freedom from both collapse and resistance to passage of flame for the required period of fire resistance. Normally, this will be ½ hour fire resistance but should be 1 hour fire resistance when fitted in compartment walls or for boiler room access. All type 1 doors should be fitted with an automatic self-closing device other than a rising butt.

19. *Type 2 door.* This door has often been referred to as 'smoke stop' and is intended to be kept closed to prevent smoke and dangerous gases from spreading and affecting several escape routes. It will also assist in restricting the spread of fire generally. The door or each leaf should satisfy the requirements of test when fixed in a 1 inch (25 mm) rebated frame as to both freedom from collapse and resistance to the passage of flame for not less than 30 minutes. The doors may be either:

i. single leaf swinging in one direction only;
ii. double leaf, each leaf swinging in the opposite direction to the other leaf;
iii. single leaf swinging in both directions;
iv. double leaf, each leaf swinging in both directions.

Such doors should be fitted with a self-closing device other than rising butts, and the frame may either have no rebate or a rebate of unspecified depths. With any door fitted with frames without rebate the clearance between door and frame, or door and door, should be as small as is reasonably practical.

20. Fire doors may incorporate fixed glazing so long as the fire resistance for integrity and stability is maintained. For particulars of fire resistance obtained by glazing in doors, reference can be made to B.S. Code of Practice 152.

I. MEANS OF ESCAPE: GENERAL PRINCIPLES

THE APPROACH TO THE PROBLEM

21. In designing means of escape from a building it is necessary to consider the behaviour of fire. Although recommendations based on such considerations can be devised they can be used intelligently only if the nature of the risks which they are intended to meet is continually borne in mind. The design of a building should therefore be analysed, part by part, in order to determine the danger which might arise from a fire, either in the part where the fire originates or in any other part to which it might spread. The fact that fire might break out in any part of a building and subsequently spread to other parts must be fully appreciated, and the importance of analysing a plan with these facts in mind cannot be overestimated. As a means of illustrating this approach to the problem, in the following paragraphs a study of the behaviour of fire is made, in the course of which the fundamental precautions which form the basis of the recommendations in this BULLETIN are deduced. Italic cross-references are given to the later parts of the BULLETIN where the general principles here deduced are expressed as specific recommendations.

22. The first and fundamental principle is the provision of alternative means of escape. The principle is widely accepted but its implications are perhaps not so fully appreciated. Moreover, there are many occasions on which the principle needs to be applied only to a limited degree or even, in some cases, not at all. This general consideration of the problem will therefore largely revolve around the one principle of alternative means of escape.

23. The primary danger associated with fire in its early stages is not flame or heat but the smoke and noxious gases produced by the fire. These may make an escape route impassable long before a temperature which is dangerous to life is reached. Therefore it is against smoke and fumes that precautions must mainly be directed. Fatalities might also occur due to toxic qualities in the smoke from some materials.

24. A fire will normally start at a point; that is to say, it will not, at the moment of initiation, involve any large area nor will it be usual for two fires to start at the same time at different points. It will at first only create a hazard in the part in which it starts. Subsequently it may spread to other parts, either along the communication routes within the building or through the building's structure. Only spread along the communication routes will be considered in this part of the BULLETIN, as this is the primary consideration so far as means of escape are concerned. (Measures to prevent spread through the structure are considered in Part III and Appendix 1.) Fire spreading along the communication routes will affect, first, other parts of the same floor and then, by way of stairways or other vertical shafts, the upper floors. The risk which may be caused by a fire in each of these three phases will be examined separately.

THE FIRST PHASE: THE EARLY STAGES OF FIRE

Small rooms

25. If a fire starts in a small room (diagram 1) the number of occupants will be so small and the distance to the doorway so short that there is little risk that the occupants will
through a single doorway. So far as this particular risk is concerned, therefore, a second way out of a small room is not necessary (para 49).

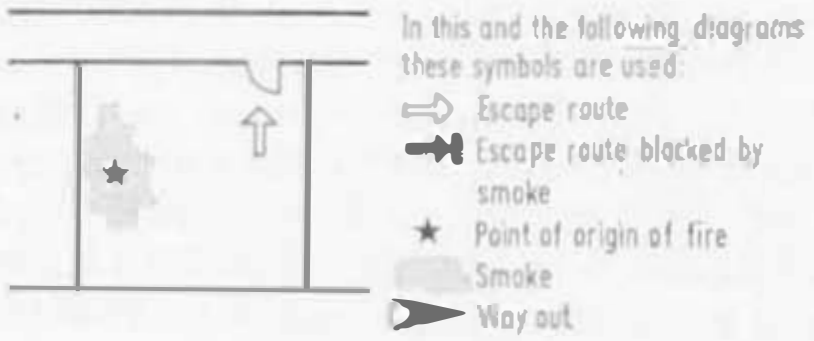

Diagram 1

Large rooms

26. In a large room (diagram 2) there is always the risk of panic, should a fire break out, because of the greater number of persons who may be involved. There is, moreover, a greater risk that a fire breaking out within the room may trap some of the occupants unless there is more than one way out of the room. For these reasons large rooms should have more than one exit doorway. These should be well distributed and the size and number should be adequate for the discharge of the occupants in a reasonably short time (paras 49(1), 50 and 51).

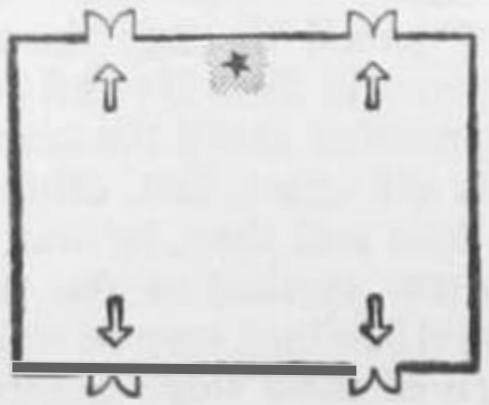

Diagram 2

Corridors

27. Should a fire start in a corridor (diagram 3) a serious condition may arise since it may not be detected before the escape route from nearby rooms is cut off by smoke. For this reason corridors which serve any room with only one exit should have wall and ceiling lining materials of such a type that there will be virtually no risk of fire starting in them (para 58).

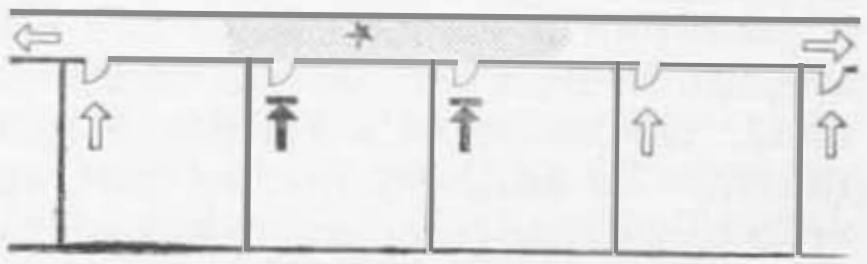

Diagram 3

Dual-purpose areas and open planning

28. As with a corridor, a dual-purpose area which serves any room with only one exit should be provided with such wall and ceiling lining materials as will keep to a minimum the risk of a fire spreading in the dual-purpose area and thus trapping the occupants in their rooms (para 58). If a dual-purpose area, which serves any room with only one exit, itself has only one way out (diagram 4), the problem will be much the same as in the dead-end corridor discussed in para 31, and the same precautions to reduce the risk should be adopted (paras 59(1) and (2)). In the situation illustrated in diagram 4, consideration would have to be given to the risk in the inner rooms, from which an outbreak would not be apparent at first. Vision panels would help to reduce this risk. A dual-purpose area, by its nature, may differ from a corridor in its content (furniture, etc.) and use, and the risk of fire is potentially greater. For this reason, if a dual-purpose area is also an area of

high fire risk, all rooms opening into it should have a second way out (para 49(3)).

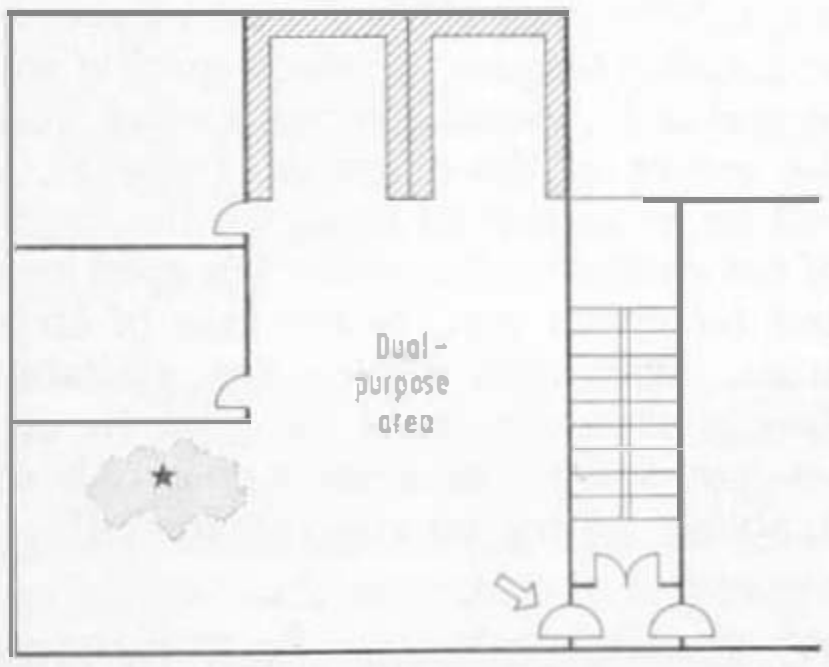

Diagram 4

Stairways

29. Where a fire starts in a stairway it will quickly make the stairway unusable by the occupants of all the floors above the point of origin of the fire. Although these persons may find it possible to escape by some other route, the fact that smoke and fire rise rapidly through any openings in the floors, and may therefore spread rapidly to upper floors, makes it imperative that all stairways should be constructed in such a way that an outbreak of fire on the stairway is virtually impossible (paras 76 and 84). Further precautions are necessary in the design of stairways, but they arise from the hazard created by a fire
outside the stairway and will be considered in paragraphs 34 and 46, dealing with the vertical spread of fire.

THE SECOND PHASE: HORIZONTAL SPREAD OF FIRE

30. Consider first a fire starting in a small room and spreading from the room to a main corridor (diagram 5). Although the occupants of the room in which the fire originates should find no difficulty in escaping, by the time the last person in the other rooms along the corridor has left the floor, there is a risk that smoke may have entered the corridor through an open door or fanlight in such quantity as to prevent the use of that part of the corridor. As a fire may break out in any one of the rooms it is desirable that escape should be

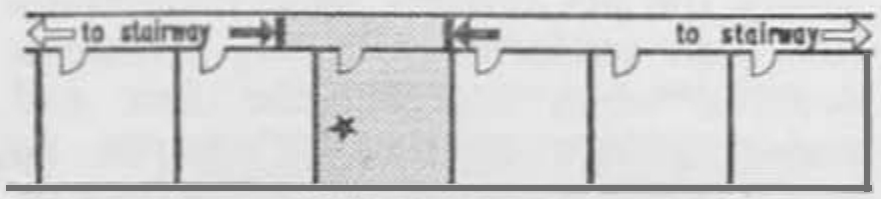

Diagram 5

possible along the corridor in either of two directions. As a general rule, therefore, on all floors above the ground floor, corridors should lead to at least two stairways placed remote from one another (paras 57, 66 and 67, *which also show the exceptions*). However, stairways should not be so far apart that the risk is again increased owing to the distance that has to be travelled in order to reach the safety of a stairway (paras 59(1) and 60(1)); thus with a long corridor, there should be more than two stairways, and the corridor itself should be divided into shorter lengths by doors placed across it at intervals in order to prevent extensive smoke spread (paras 59(3) and 60(3)). A ground-floor corridor should be treated similarly unless all rooms have their own separate exits to the open air, in which case, so far as escape from the ground floor is concerned, the number of exits from the corridor will not be significant (para 62).

31. Were the principle that escape along corridors should be possible in either of two directions to be rigidly applied, it would be necessary for stairways to be placed at the extremities of all corridors. The condition known as a 'dead-end' corridor (diagram 6)—which is a great convenience in planning—would not then be possible. It is generally accepted, however, that if the dead-end corridor is short, and the number of persons using it is limited, the risk is not sufficiently great to preclude its use (paras 59(1) and (2), and 60(1) and (2)). It should be noticed, however, that although the corridor in diagram 6 is a dead end, two separate exits are accessible from it. Dead ends should also be separated from any other part of the corridor beyond the nearest stairs by a type 2 door.

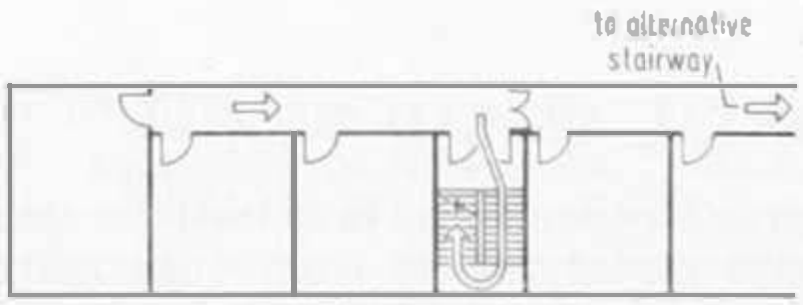

Diagram 6

Interconnected and open-plan areas

32. The risk of smoke spreading horizontally is greatly increased with open plans, where several different areas are not separated by full height floor-to-ceiling walls. With open plans it may, of course, be possible to raise the alarm quickly and to escape in several directions away from the source of the outbreak. However, it will be important to check on the length of the escape routes across the open area and to ensure that, in the case of large areas, alternative routes are available. Special attention must be paid to any small enclosed rooms which open only on to a large open-plan area (diagram 4).

33. Consideration must also be given to the effect that a considerable quantity of loose and fixed furniture, acquired after the building is occupied, might have in extending or obstructing an escape route. Occupants must be aware of the necessity for quick escape in panic conditions. Periodic inspections, as suggested in paragraphs 139 and 140, will be desirable.

THE THIRD PHASE: VERTICAL SPREAD OF FIRE

34. Having devised means, by properly designing and constructing the main horizontal escape routes, to ensure that no person will be trapped on a floor by a fire spreading horizontally, it now remains to consider what is needed to ensure that the occupants of all the floors above the ground will be able to reach the final exit in safety. This entails studying the risk created by a fire on any lower floor spreading to a stairway and cutting off that escape route from the upper floors. The two conditions (stairway arrangement on ground and upper floors) will be considered separately.

Stairway arrangement above ground floor level

35. In the plan shown in diagram 7 a fire starting in one room has spread along the corridor and entered both stairways. Although the occupants of the rooms on this floor can be assumed to have escaped before the fire reaches these dimensions (the plan conforms with the principles deduced when studying the first and second phases of fire), it cannot be assumed that the occupants of the floor or floors above will have escaped in the same time. Should their movements be delayed it is clear that both their escape routes to the ground will be cut off by the fire. The

risk from smoke and subsequently fire spreading up stairways and other vertical shafts is a serious one and there have been many deaths from this cause. In order to reduce the risk to the minimum it is essential that all stairways should be 'enclosed'. 'Enclosure' consists of surrounding stairways by fire-resisting walls or partitions (paras 75-77) and providing fire doors of the appropriate type in all internal openings into the enclosure (paras 79-81).

36. The effect of enclosing the stairway in the plan shown in diagram 7 is shown in diagram 8. Provided that the doors in the stairway enclosure on the floor on which the fire starts are closed, smoke will be prevented from entering either stairway and both will be available for escape from upper floors. As the enclosure is continuous there are at least two sets of doors in each enclosure between the corridor on any one floor and the corridor on any other floor. Even if the doors to one stairway on the floor where the fire began are left open, so that the stairway is filled with smoke, the doors in the enclosure on the upper floors will prevent smoke from spreading along the upper corridors and the occupants can therefore make their way without difficulty to the other stairway. Of course, if the doors to both stairways are left open on the floor in which the fire starts, the escape routes from the upper floors will again be cut off (paras 89 and 137). It is impossible to guard against every contingency, however, and the most that can reasonably be required is that there should be at least two stairways properly enclosed on all floors, and that the occupants should be aware of the need to close type 2 firedoors, particularly in an emergency (see para 89). These doors should be kept closed as far as is practicable.

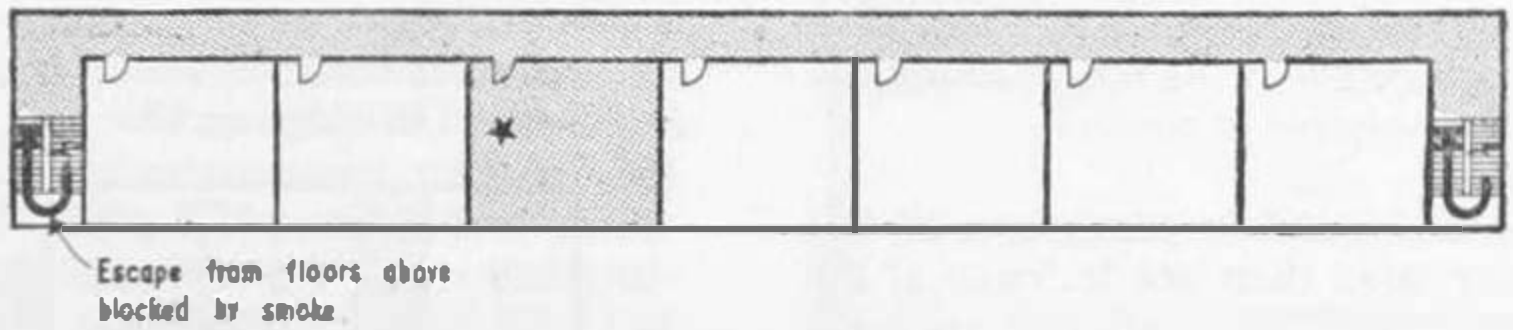

Diagram 7

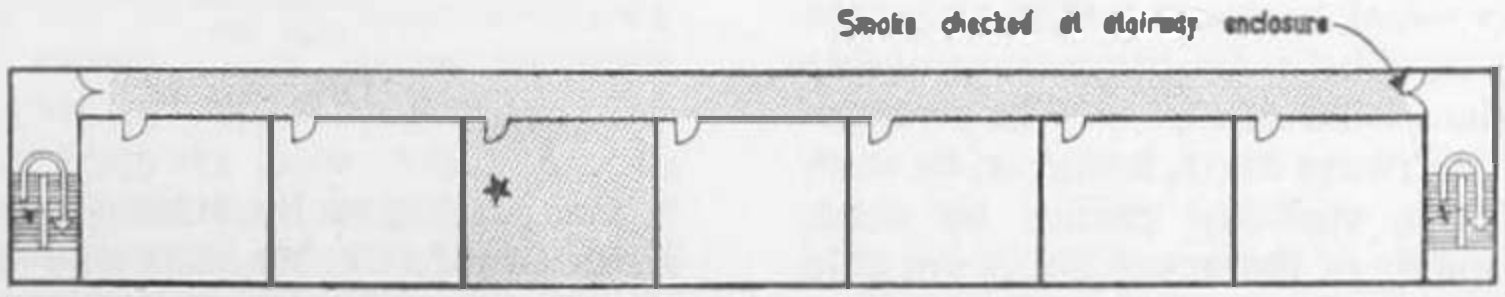

Diagram 8

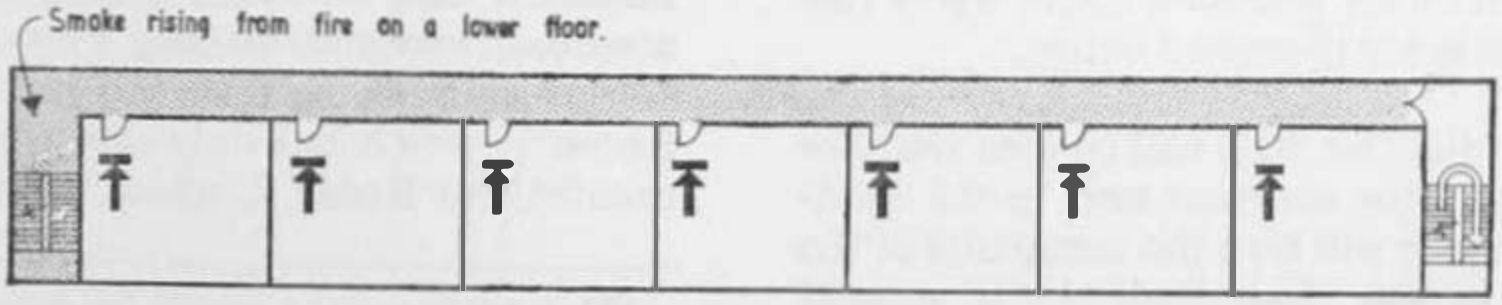

Diagram 9

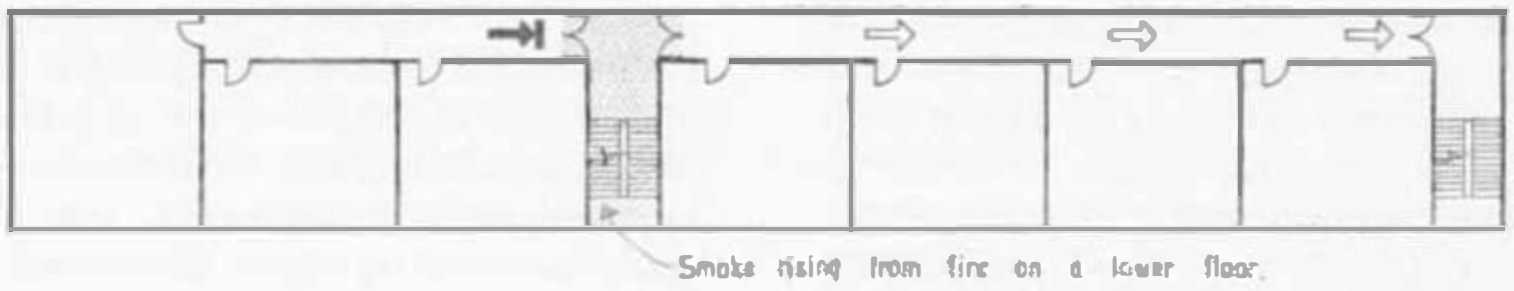

Diagram 10

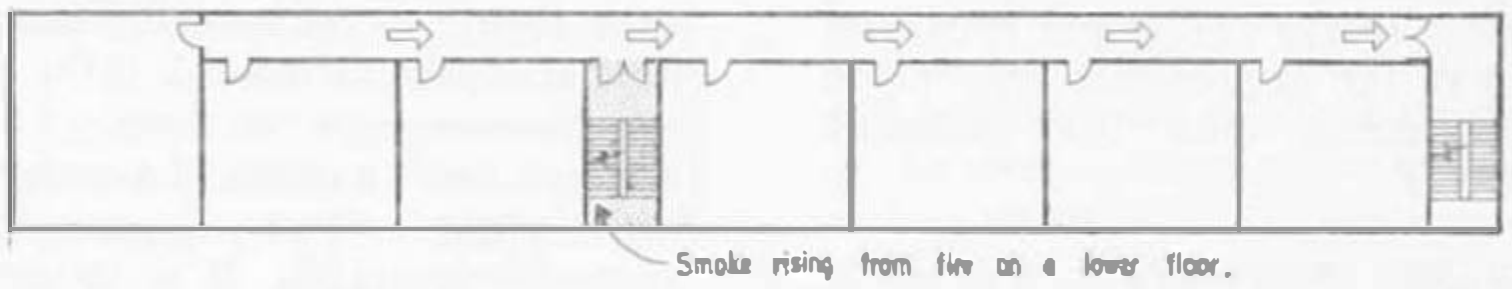

Diagram 11

37. It may be thought that if one stairway is enclosed in order to provide a safe route to the ground any other stairways need not be enclosed. The danger of this is shown in diagram 9, where a fire starting on a lower floor has passed up an unenclosed stairway and spread along an upper floor. The enclosed stairway still provides a safe escape route to the ground but the occupants of the rooms along the corridor are unable to reach it.

38. As mentioned in paragraph 36 fire may enter more than one stairway at the same time even with properly enclosed stairways, but the risk of this is very small and it is usual to assume that only one stairway is likely to become unusable during the period of escape. The arrangement of stairways must, however, be such that, if one stairway cannot be used, the occupants of the upper floors are able to reach an alternative stairway. Instances in which faulty planning might make this impossible are discussed below.

39. In diagram 10 it will be seen that fire passing up the stairway next to the dead-end corridor will trap the occupants of the rooms in the dead end. As a general principle, the stairway enclosure on upper floors should be arranged so that any part of a horizontal escape route which forms the sole means of escape from any portion of a building does not pass through the enclosure. The remedy for the fault illustrated in diagram 10 is shown in diagram 11 (which is identical with diagram 6).

40. Another instance of faulty planning is illustrated in diagram 12.

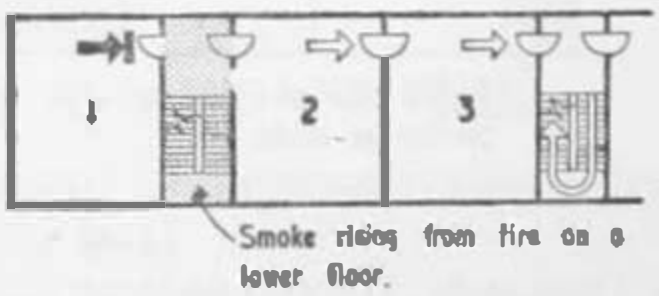

Diagram 12

Fire passing up the stairway may make escape by that route impossible and any room opening into the stairway enclosure should, if used for teaching purposes, have a second way out leading by a separate escape route to the final exit (para 49(2)). Room 1, which has only one way out, is unsafe[4], but Room 2, which has a second

[4]This arrangement would be acceptable in some two-storey schools; see paragraph 66.

way out through Room 3 to another stairway, is safe. (The need to provide a second way out of a room which opens into a stairway enclosure does not apply to rooms, such as lavatories, which are used only for a short time.) One remedy for the fault shown in diagram 12 is shown in diagram 13.

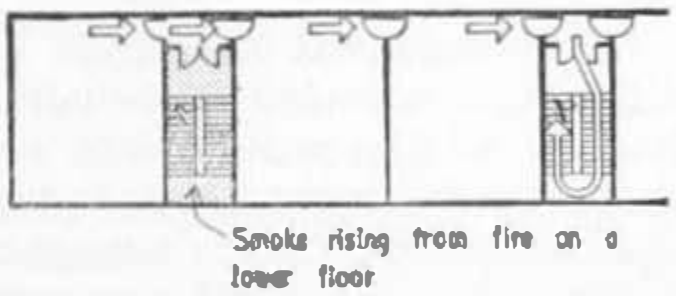

Diagram 13

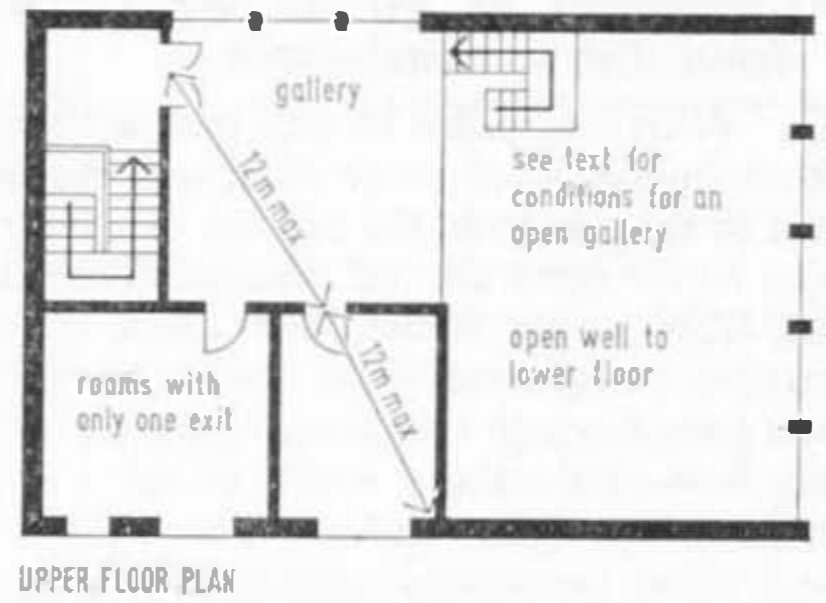

Diagram 14

Open plans on two floor levels

41. In general, the principles which should be observed are the provision of alternative escape routes and the separation of the two routes by two sets of type 2 fire doors at each level. However, in small sections of accommodation where an open stairway or an open well connect two floor levels, it is possible to consider this on the same principle as for the open-plan areas (diagrams 25 and 26). For example (as diagrams 14 and 15), rooms with only one exit on an upper level may have an escape route across an open gallery, provided it is not longer than 12 m to the exit from the floor. Also the open area at the lower level must not exceed 200 m² or be associated with any area of high fire risk (e.g., kitchen servery). If these conditions cannot be met, the open gallery must be sealed off from the lower area by fire-resisting glazing or other method.

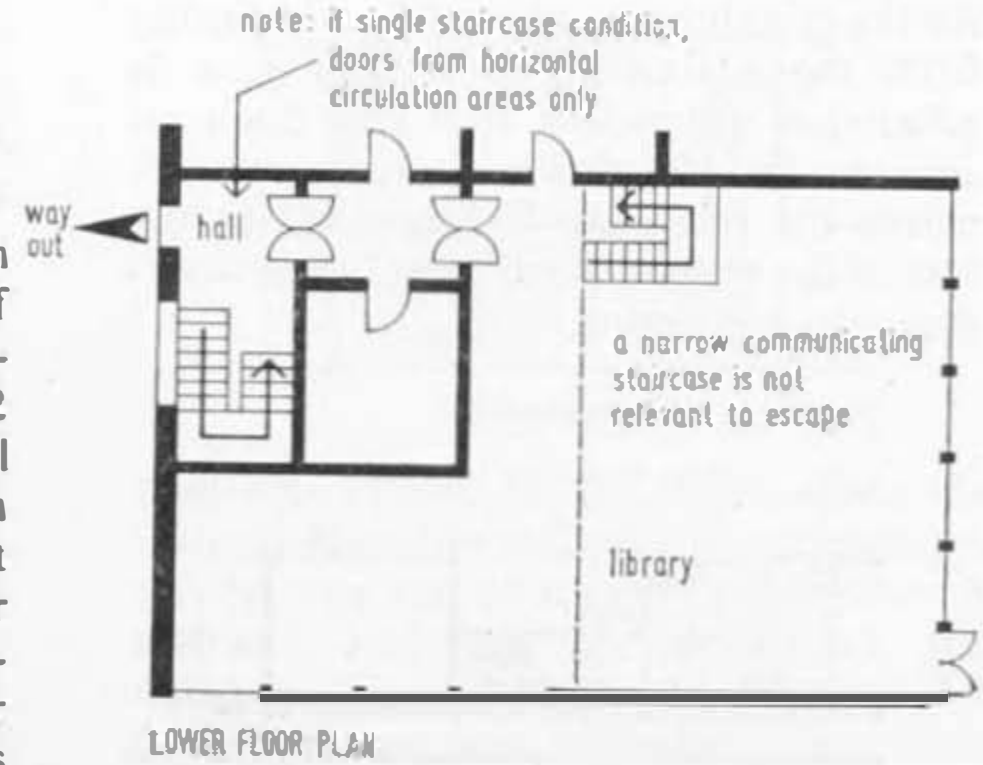

Diagram 15

Arrangement of ground floor exits from stairway enclosures

42. A critical point in any escape route from buildings of more than one storey will be the way from the bottom of a stairway to the open air. All persons descending from upper floors, and often those leaving the ground floor, converge upon and pass through this area. A fire spreading to it will make a whole escape route from every floor useless. The simplest and safest precaution against such a risk is to provide a stairway enclosure which, on the ground floor, has a doorway leading directly to the open air and which, except for the minimum number of doors opening from the horizontal circulation area, is otherwise completely shut off. Such an arrangement is shown in diagram 16, where the enclosure is connected to the rest of the ground floor by only one doorway into a corridor.

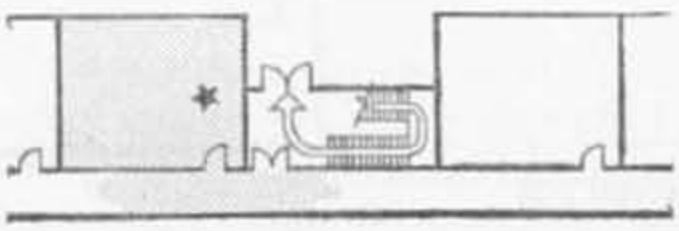

Diagram 16

43. A stairway enclosure by definition (para 12) includes any horizontal circulation area which is not separated from the stairway by a door or pair of doors. It would thus be possible to re-arrange diagram 16 so that the enclosure, by crossing the corridor embraces part of it, as shown in diagram 17. Here, two doorways connect each enclosure with the rest of the school.

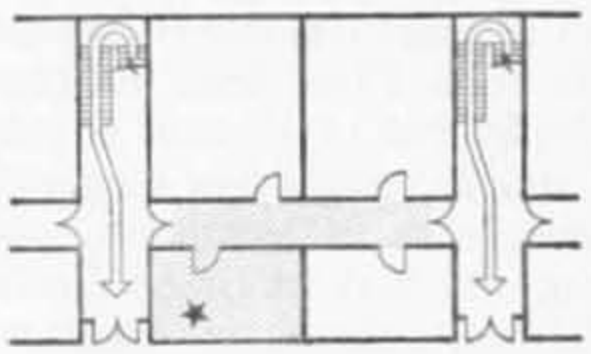

Diagram 17

44. The arrangement in diagram 17 can be still further extended to include more of the horizontal circulation, into which a number of rooms may open, as in diagram 18. It was noted that where a room on an upper floor opens into a stairway enclosure there should be a second way out of the room so that, if smoke is passing up the stairway from a lower floor, it does not prevent all escape from the room (see diagram 12). On the ground floor, however, there is no such risk and, so far as escape from the rooms on the ground floor is concerned, rooms may open into a stairway enclosure even though the rooms have only one exit. It is, of course, still necessary to ensure that escape from the horizontal circulation within this extended stairway enclosure is adequate. It is evident that with the arrangement shown in diagram 18 there is a greater risk of a stairway being attacked by fire than in diagrams 16 and 17. Nevertheless the arrangement is acceptable because escape from upper floors should always be possible by another stairway. It has not, however, the same degree of safety as those shown in diagrams 16 and 17, and every effort should be made to reduce to a minimum the number of rooms opening into a stairway enclosure on the ground floor, especially in high buildings.

45. Diagrams 17 and 18 show stairway enclosures which include part of a corridor, but they could include part that is a dual-purpose area, so long as its use is not

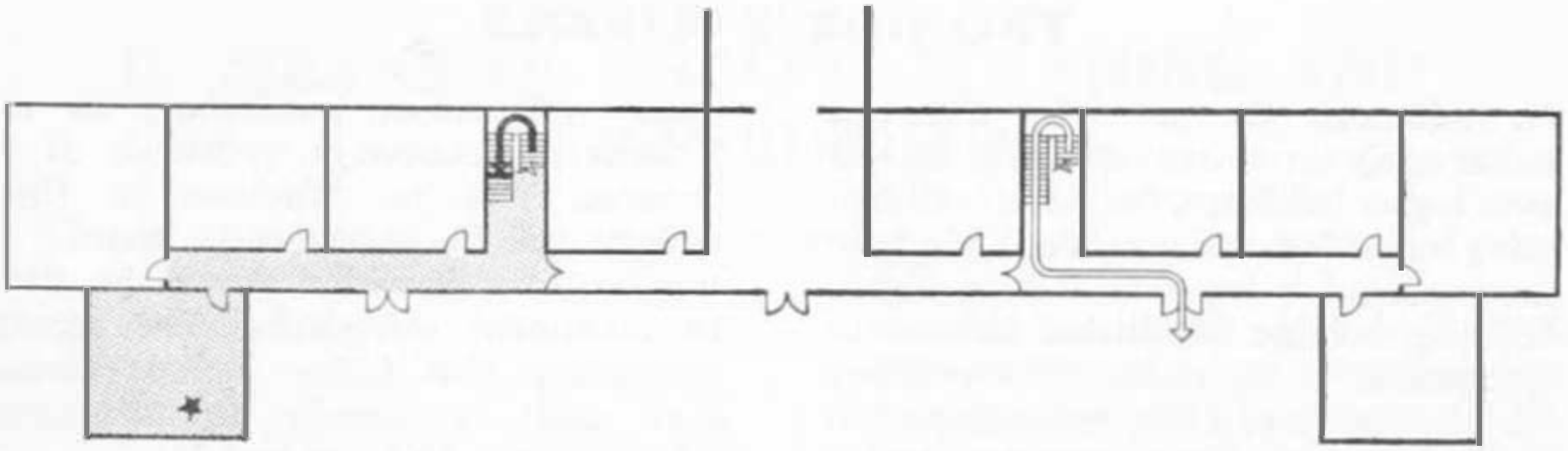

Diagram 18

likely to obstruct the free movement of people escaping from the foot of the stairway to the open air and it is not an area of high risk (para 78). A common arrangement is shown in diagram 19 where a main stairway delivers into a spacious entrance hall or concourse. No exception need be taken to such a plan provided that the walls surrounding the entrance hall are treated as forming the enclosure to the stairway and are therefore fire resisting, and openings are fitted with self-closing, type 2, fire doors.

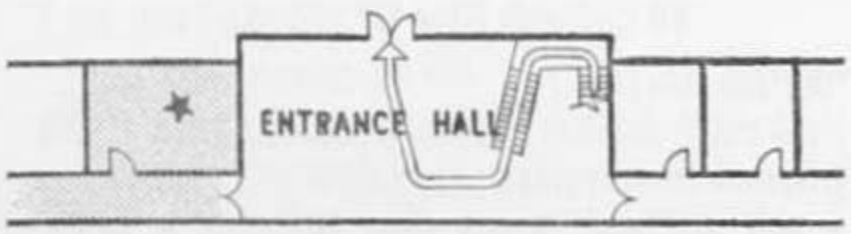

Diagram 19

46. The fact that a stairway enclosure may by definition be extended to include part of a horizontal circulation area leads to the possibility that enclosures might be extended until they meet one another. Diagram 20 shows one way in which this might happen. This introduces a serious risk that one fire might quickly make both stairways unusable. As a safeguard, therefore, there should be at least two sets of self-closing, type 2, fire doors between any two stairway enclosures, as shown in

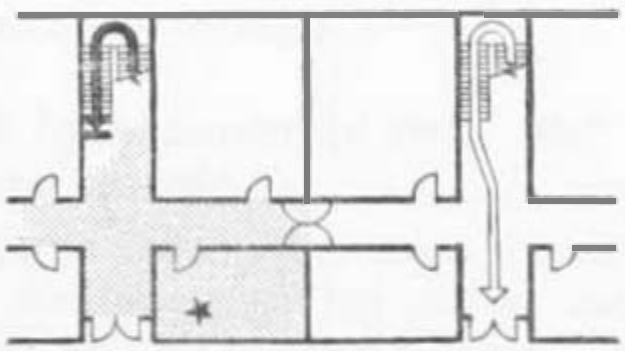

Diagram 20

diagrams 17 and 18. On floors above the ground floor the difficulty of arranging a second way out of rooms opening into a stairway enclosure, by restricting the number of rooms which can open into an enclosure, will tend to reduce the size of the enclosure. In most cases, therefore, at least two sets of self-closing, type 2, fire doors will automatically be provided. On the ground floor there will be no automatic restriction on the size of the enclosure, and it is on this floor that the deliberate separation of stairway enclosures by two sets of self-closing, type 2, fire doors may be necessary. Of course, if the stairways are closely enclosed on the ground floor, as shown in diagram 16, this separation will, as on upper floors, be automatically provided.

TWO-STOREY SCHOOLS

47. Although the principles discussed earlier apply as much to two-storey schools as to higher buildings, the risk of children being trapped on the upper floor of a two-storey school is less than it is in higher buildings because the vertical distance to the ground is so short. In two-storey schools, therefore, it may be reasonable to modify the general recommendations for means of escape, particularly in the number of stairways provided. It is assumed that no windows in these schools will be permanently sealed. If they are, consideration should be given to additional safeguards. The recommendations that follow include several that apply specifically to two-storey schools (paras 57(3), 66 and 75).

II. MEANS OF ESCAPE: PLANNING AND CONSTRUCTION

ROOM EXITS

Doors and windows

48. Exits from rooms will, of course, normally be through doorways, but ground-floor windows may, in certain circumstances, provide alternative means of escape; this is dealt with separately in paragraph 56 below. Special consideration should be given to the position of doors in high fire risk rooms on upper floors in that, if only one door is provided, it can be reached easily from any part of that room.

Number of room exits

49. Only one room exit need be provided from any room except where:

(1) the room is an assembly space, dining space or space likely to have more than 100 occupants, in which case Table 1 in paragraph 50 will apply; or

(2) the room is on part of an upper floor and opens directly into a stairway enclosure, in which case the room should have a second exit door leading by a separate escape route to a final exit (this does not apply in two-storey schools where either a single stairway is provided, as in paragraph 66, sub-paragraphs (1)-(3), or the stairs are separated, as in paragraph 75, nor does it apply to any lavatories opening into stairways, which need have only one exit); or

(3) the room opens into a horizontal circulation area (including any area which can be associated with the horizontal circulation area by the use of movable partitions) which is (i) lined with material of a lower standard than that recommended in paragraph 58[5], or (ii) an area of high fire risk; in either of which cases the room should have a second exit leading by a separate route to a final exit; or

(4) in a laboratory or other high fire risk room the single exit door is in a hazardous position.

Exits from assembly halls and other large spaces[6]

50. Exits from every part of assembly halls, dining rooms (or spaces used for dining), and all rooms or spaces likely to have more than 100 occupants, should be provided in accordance with Table 1. The exits should be remote from one another. Lecture theatres seating more than 60 on fixed tiered bench seats may require more than one exit, depending on its position in the room and the arrangement of seats.

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[5]The linings should in any case satisfy the requirements of Table VII in paragraph 98.

[6]Paragraphs 50-54 apply to assembly halls when they are used solely for school activities. If they are licensed for public assembly, it will usually be necessary to obtain the approval of the local licensing authority whose requirements may not be satisfied by these recommendations. Additional requirements of a minor nature necessary to satisfy the local licensing authority may be provided within current cost limits, but capital investment on the educational programmes will not be available in excess of current cost limits to permit school halls to be treated as places of public assembly.

Table 1—Number and Width of Exits from every Part of Assembly Halls, Dining Spaces and all Rooms likely to have over 100 Occupants.

No. of occupants*	Minimum no. of exits	Minimum clear width of each doorway when open
100— 200	2	850 mm
201— 500	2†	1350 mm
501— 750	3†	1350 mm
751—1000	4‡	1350 mm

*With fixed seating, the same as the number of seats; otherwise, on the basis of 0·45 m² of floor area per child in assembly halls and 0·90 m² of floor area per child in dining spaces and gymnasia.

†Each exit should lead by a separate route to a final exit.

‡At least 3 of the exits should lead by separate routes to a final exit. The fourth exit may use part or the whole of the escape route from one of the other exits.

51. Where an exit does not discharge either direct to the open air or into a stairway enclosure[7], the distance to an external doorway or a stairway should be short and the route direct. At its narrowest point the route should not be less than the width of the exit. If more than one exit uses part or the whole of the same escape route, the width may need to be increased accordingly.

52. Doors from assembly halls, dining rooms (or spaces used for dining) and all other rooms that may have more than 50 occupants should open in the direction of escape, or swing both ways. The fastenings to these doors, and all other doors except from rooms which are not dual-purpose areas, should be as in paragraph 87.

[7]See paragraph 71 for widths of stairways serving assembly halls only.

53. In assembly halls designed to seat more than 200 occupants, seats should be fixed together in groups of at least four if the hall is likely to be used frequently by a seated audience. In large assembly halls, consideration may need to be given to the desirability of fixing some or all of the seats to the floor, and to their arrangement, if fixed.

54. If the stage of an assembly hall is likely to be used for any purpose requiring scenery or costumes, or if a cinematograph projection room is provided, adequate means of escape from these areas (and also the arrangement and construction of the projection and ancillary rooms) isspecially important. It is not intended, however, to make detailed recommendations on these points.

Exits from boiler rooms

55. Although it is not necessary to provide two ways out of every boiler room, it is desirable that there should be two ways out of large boiler rooms (although one may be a vertical ladder), and these ways out should be remote from one another. Boiler rooms should, wherever possible, be approached only from outside a building. Where an internal approach is proposed, it must be through two separate self-closing fire doors[8], type 1, with a space between them forming a smoke-lock, which should be ventilated.

Windows and window exits

56. All planning guidance in this BULLETIN assumes that all spaces normally occupied in a building will have windows of a type which, in an emergency, would permit self-rescue. Should the

[8]See paragraphs 17-19 for description of fire doors.

spaces have no windows suitable for rescue, then consideration must be given to the provision of additional safeguards. For example, any such space accommodating more than twenty-five people should have two separate exits from that space (see diagram 27). Smaller rooms should have alternative escape routes from the door of the room. Except from assembly halls, dining spaces, and from infants' schools as a whole, an escape route from a ground-floor room or space may be obtained through windows, provided that:

(1) the bottom of the opening lights are not more than 900 mm above the floor or 1200 mm above the ground;

(2) the design and placing of the windows permit of easy escape through them;

(3) the windows can be opened easily.

HORIZONTAL CIRCULATION AREAS

Number of ways out of horizontal circulation areas

57. All horizontal circulation areas forming part of an escape route should have at least two ways out leading by separate escape routes to the final exit, except that there need be only one way out from:

(1) a ground-floor corridor with a fixed partition designed to serve not more than 160 children and in which no room exit door is more than 18 m from the external door from the corridor (diagram 24);

(2) a ground-floor corridor with a movable partition (diagram 27) or a ground-floor dual-purpose area (diagram 30), in either case designed to serve not more than 120 children and in which no room exit door is more than 12 m from an external door;

(3) the first floor of a two-storey school or two-storey part of a school which is permitted under the condition specified in paragraph 66(1)-(3) to have only one stairway (diagrams 24, 30 and 36);

(4) a dual-purpose area on a floor above the ground floor provided that (i) it is designed to serve not more than 120 children, (ii) no room exit door opening into the dual-purpose area is more than 12 m from the nearest stairway, and (iii) the dual-purpose area opens into a horizontal circulation area from which there are at least two ways out (diagrams 29 and 35).

Wall and ceiling lining materials

58. All wall and ceiling lining materials in horizontal circulation areas forming part of escape routes should be non-combustible or possess a Class 0 surface[9]. Any spaces which may be associated with these horizontal circulation areas by the use of movable partitions should have equivalent lining materials.

Planning limitations

59. Except as in paragraph 62, if the horizontal circulation area between two stairways or external doors, or in a dead

[9]See paragraph 14 for the classification of the surface of lining materials, and note at foot of Table VII in paragraph 98 for information about the treatment of lining materials.

end, consists wholly of corridor with fixed partitions:

(1) at least one door from every room opening into the corridor should be within 30 m of the nearest external door or stairway (diagram 21) or, in a dead-end corridor (diagrams 22 and 23), within 18 m of the nearest external door or stairway;

(2) no dead end (diagram 22) or, where more than one dead end converge (diagram 23), no combination of dead ends should be designed to serve more than 160 children on the ground floor or 120 children on an upper floor;

(3) type 2 fire doors of the kind described in paragraphs 17-19 should be fitted across the corridor at intervals of about 60 m (diagram 21);

(4) dead ends should be separated from any other part of the corridor by a type 2 door across the corridor just beyond the staircase nearest the dead end.

60. Except as described in paragraph 62, if the horizontal circulation area between two stairways or external doors or in a dead end consists wholly or partly of

(i) corridor with movable partitions, or

(ii) dual-purpose areas,

(1) at least one door from every room opening into the circulation area should be within 18 m of the nearest external door or stairway (diagrams 26, 28-31) or, in a dead end (diagrams 26, 29 and 35), within 12 m of the nearest external door or stairway;

(2) no dead end or, where more than one dead end converge, no combination of dead ends should be designed to serve more than 120 children (diagrams 26, 29 and 35);

(3) fire doors of the kind described in paragraphs 17-19 should be fitted across the circulation area at intervals of about 45 m.

61. If dual-purpose or open-planned areas are part of an escape route, the precautions about door locks recommended in paragraph 88 should be taken into account. Their effect is that a dual-purpose area should never be permitted to be locked at any time when that part of the school is occupied. The recommendation in the Department of Education and Science's Education Pamphlet No. 53, *Safety at School*[10], that laboratories should be kept locked when no one is authorized to use them, should be considered in this connection. If local education authorities decide to have laboratories or any other rooms locked when the school may be occupied, this would obviously preclude their use as dual-purpose areas forming part of any escape routes.

62. In single-storey schools or parts of schools and on the ground floors of schools of greater height, the limitations of paragraphs 59 and 60 will apply if escape is possible only through the normal circulation area. If, however, every room opening into a horizontal circulation area has a second way out direct to the open air, either through an external door or, except in assembly halls, dining spaces and throughout infants' schools, through a window, as described in paragraph 56, no planning limitations on the horizontal circulation areas are necessary.

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[10]H.M.S.O. (1970).

Other recommendations

63. The widths of corridors forming part of an escape route should be adequate for the numbers likely to use them[11]. They should be well lighted and ventilated.

64. If steps are required for small changes of level in horizontal circulation areas, there should be at least three risers together. For such steps no rise should exceed 152 mm and the going should not be less than 305 mm (paragraph 73 does not apply in this case).

65. All glazed areas in partitions between any room of high fire risk and any horizontal circulation area should be fixed and should have a fire resistance of not less than half-an-hour and not extend below 900 mm above floor level.

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[11] Main corridors are unlikely to be less than 1·8 m wide for normal circulation; this will be adequate in the case of fire. Short corridors serving small numbers (e.g., in a small administrative wing or serving a single classroom) might be less than 1·8 m without endangering life in a fire.

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DIAGRAMS 21-24
CORRIDORS WITH FIXED PARTITIONS

In diagrams 21-23 the corridor has at least TWO ways out (see paragraph 57).

BETWEEN STAIRWAYS OR EXTERNAL DOORS: ANY FLOOR.

1. One door of every room within 30 m of nearest stairway or external door.
2. Smoke-stop doors across corridor at about 60 m intervals.

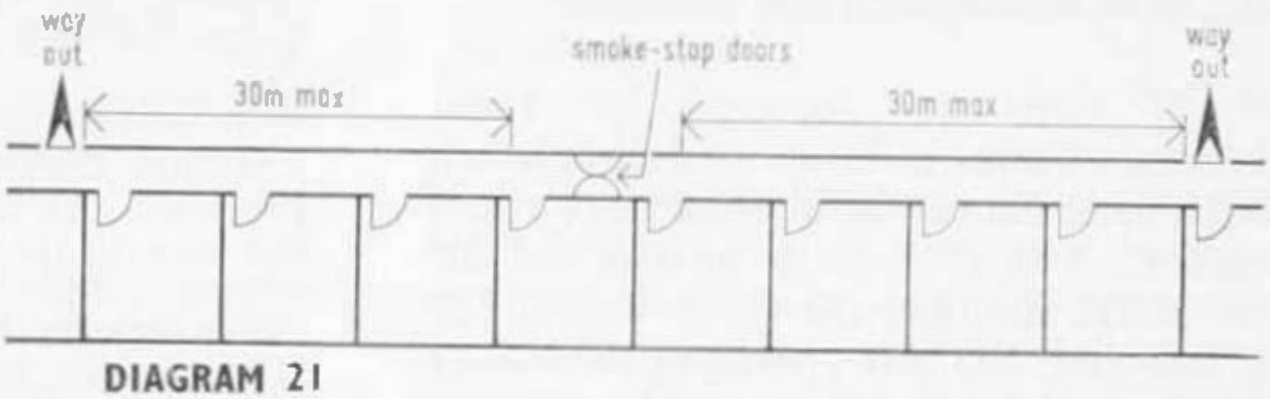


DIAGRAM 21

DEAD END: ANY FLOOR.

1. One door of every room within 18 m of nearest stairway or external door.
2. Number of children in rooms opening off a dead end—diagram 22—or a combination of dead ends—diagram 23—(rooms 1-4 in both examples) is limited to 160 on the ground floor and 120 on upper floors.

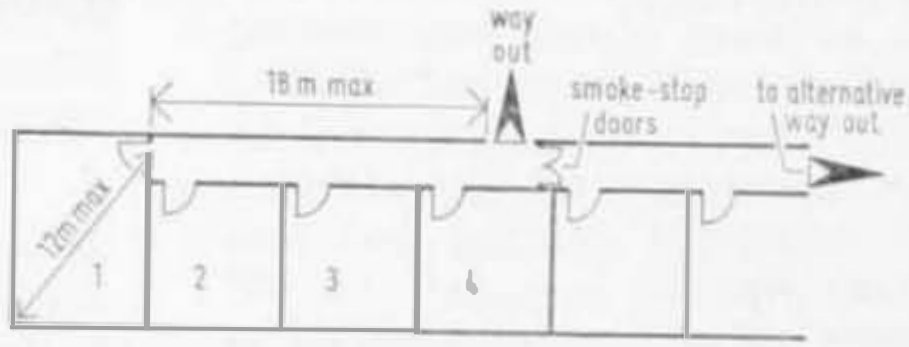


DIAGRAM 22

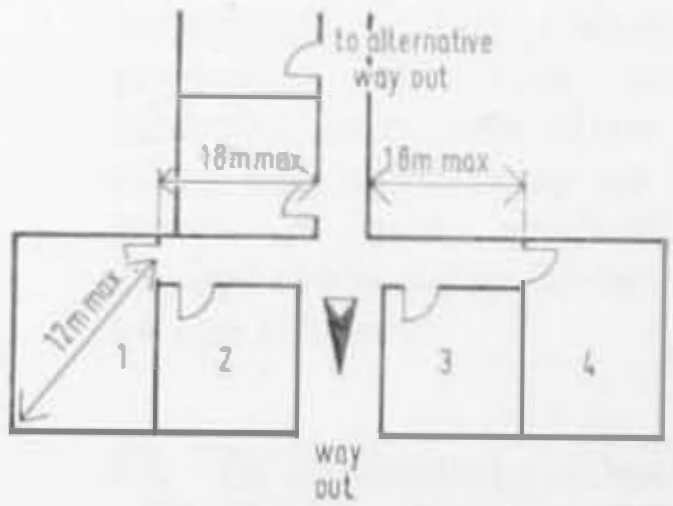


DIAGRAM 23

GROUND FLOOR WITH ONLY ONE EXIT IN SCHOOL OF ANY HEIGHT OR FIRST FLOOR OF 2-STOREY SCHOOL WITH ONLY ONE STAIRWAY.

1. One door of every room within 12 m of stairway or external door.
2. Number of children is limited to 160 on the ground floor or 120 on the first floor.
3. If it is the first floor the stairway is arranged as described in paragraph 66(3).

In diagram 24 the corridor has only ONE way out (see paragraph 57(1) and (3)).

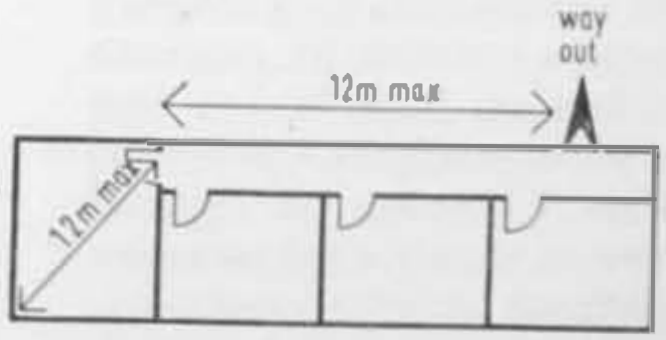


DIAGRAM 24

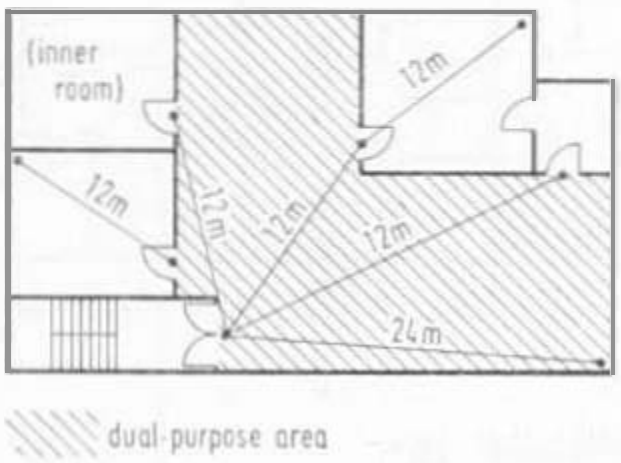
NOTE:

1. None of the limitations shown on this page need apply to the ground floor in any school if the conditions of paragraphs 56 and 62 are satisfied on windows and walls.
2. For limitations on the use of wall and ceiling lining materials see paragraph 58.
3. In these rooms no point should be more than 12 m from the nearest exit from that room.

INTERCONNECTED AND OPEN-PLAN AREAS

FIRST FLOOR WITH ONLY ONE EXIT

(also Ground Floor, if escape is not possible through windows—see paragraph 56).



NOTE:
All distances shown are in metres and are the MAXIMA recommended:

12 m (40 ft)
18 m (60ft)
24 m (80 ft)
30 m (100 ft)

DIAGRAM 25

1. Total number of children is limited to 120.
2. One door of every inner room to be within 12 m of the exit from the floor.
3. Maximum distance from the door to any part of an inner room should not exceed 12 m.
4. Every point on the floor to be within 24 m of the exit from the floor.
5. Dual-purpose area must NOT be an area of high fire risk.
6. There should be no smaller rooms inside an inner room.

NOTE:

The travel distances indicated on this diagram should be measured in a straight line across the floor. If an unbroken length of fixed furniture, island benches or other obstruction in the path of escape exceeds either 5 m in length and 1·5 m in height, or 9 m in length and 1 m in height, it must be so placed that the travel distance is not increased beyond the recommended maxima.

ANY UPPER FLOOR WITH AT LEAST TWO WAYS OUT

(also Ground Floor, if escape is not possible through windows—see paragraph 56).

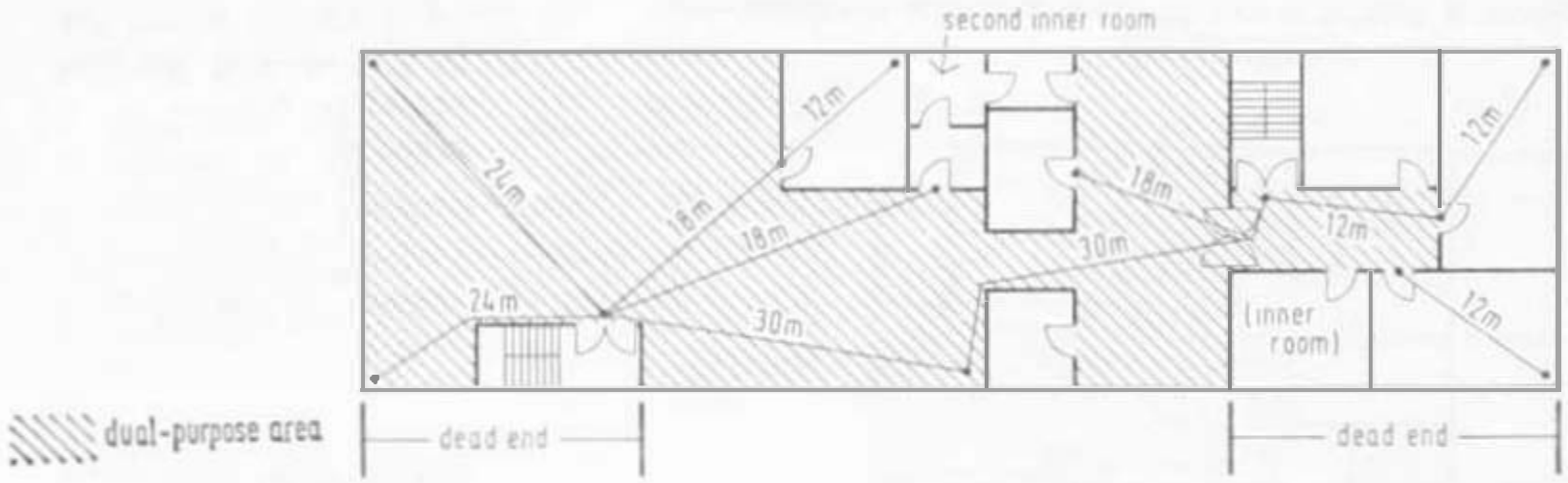


DIAGRAM 26

1. Total number of children is limited in accordance with the number and width ofstairways (Tables I and il).
2. The total number of children in a dead end is limited to 120.
3. The maximum distance from the door to any part of an inner room should not exceed 12 m.
4. One door of every inner room should be within 18 m of the nearest exit from the floor if there are alternative routes from that door. If escape is possible in one direction only from that door it should be within 12 m of the nearest exit from the floor.
5. Every point on the floor from which there are alternative routes should be within 30 m of the nearest exit from that floor.
6. Every point on the floor from which all possible escape routes are contained within an angle of 45° should be within 24 m of the nearest exit from that floor.
7. If a second inner room is provided it must have alternative escape routes which are separated by two type-2 fire doors and the room should not exceed 15 m^2 in area.

NOTE:

The travel distances indicated on this diagram should be measured in a straight line across the floor. If an unbroken length of fixed furniture, island benches or other obstruction in the path of escape exceeds either 5 m in length and 1·5 m in height, or 9 m in length and 1 m in height, it must be so placed that the travel distance is not increased beyond the recommended maxima.

INTERNALLY PLANNED ROOMS:

from which no window escape is possible:

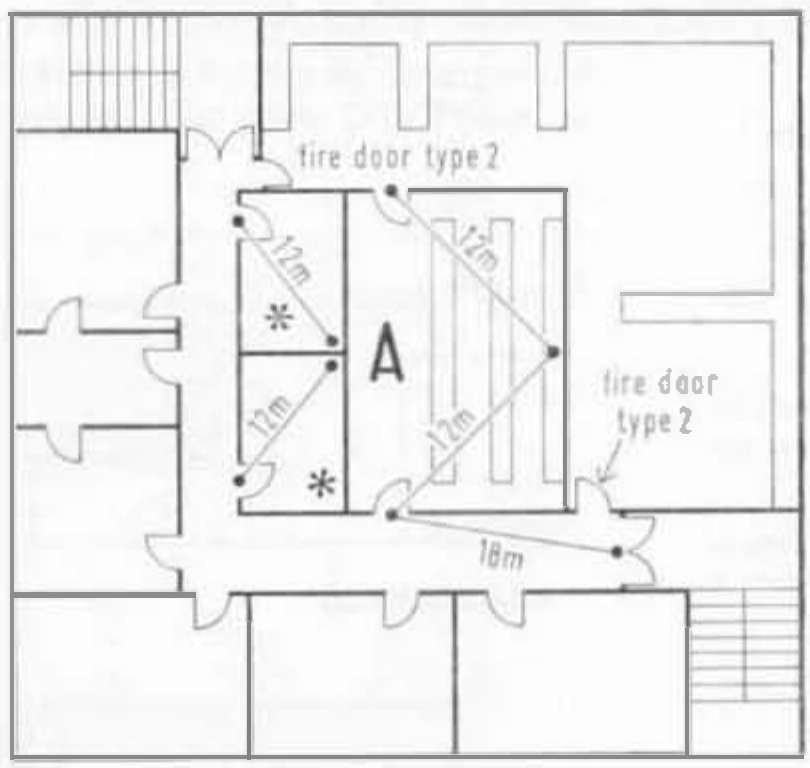


DIAGRAM 27

1. In Room 'A', if number of children exceeds 25, TWO separate exits from the room are required, the distance from the room doors to exits to be maximum of 18 m or, if the corridor is a dead-end, a maximum of 12 m.

2. Smaller internal rooms have alternative directions of escape from their doors *. One of these routes must NOT exceed 18 m.

3. Any point in any internal room must be within 12 m of the nearest exit from the room.

NOTE:

The travel distances indicated on this diagram should be measured in a straight line across the floor. If an unbroken length of fixed furniture, island benches or other obstruction in the path of escape exceeds either 5 m in length and 1·5 m in height, or 9 m in length and 1 m in height, it must be so placed that the travel distance is not increased beyond the recommended maxima.

DIAGRAMS 28-30

DUAL-PURPOSE AREAS WITH FIXED PARTITIONS—1

—SERVING ROOMS HAVING ONLY ONE WAY OUT

dual-purpose area

In diagrams 28 and 29 the horizontal circulation areas have at least TWO ways out (see paragraph 57).

BETWEEN STAIRWAYS OR EXTERNAL DOORS: ANY FLOOR.

1. One door of every room within 18 m of nearest stairway or external door.
2. Type 2 fire doors across horizontal circulation area at about 45 m intervals.

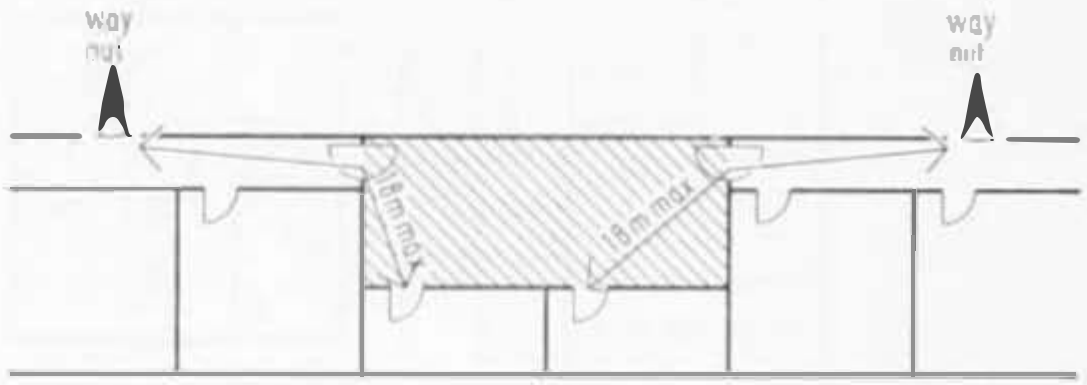


DIAGRAM 28

DEAD END: ANY FLOOR.

1. One door of every room within 12 m of nearest stairway or external door.
2. Number of children in rooms opening off a dead end (rooms 1-3 and the dual-purpose area in diagram 29) or a combination of dead ends (cf. diagram 23) is limited to 120.

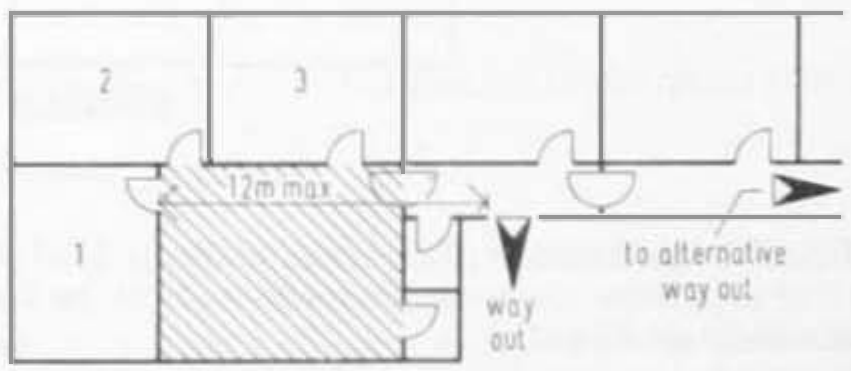


DIAGRAM 29

In diagram 30 the horizontal circulation area need have only one way out (see paragraph 57(2) and (3)).

GROUND FLOOR WITH ONLY ONE EXIT IN SCHOOL OF ANY HEIGHT OR FIRST FLOOR OF 2-STOREY SCHOOL WITH ONLY ONE STAIRWAY.

1. One door of every room within 12 m of stairway or external door.
2. Number of children on the one floor is limited to 120.
3. For the first floor the stairway is arranged on the ground floor as described in paragraph 66(3).

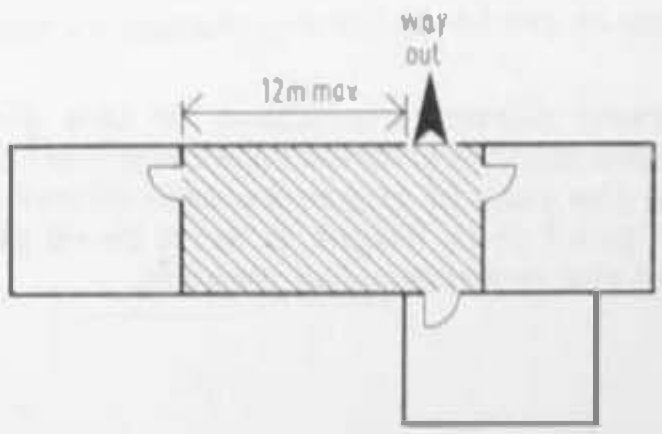


DIAGRAM 30

NOTE:

1. Except on the ground floor (see Note 2 below) NONE of the dual-purpose areas shown on this page should be *areas of high fire risk*. (See paragraph 49(3)).
2. None of the limitations shown on this page need apply to the ground floor in any school if the conditions of paragraphs 56 and 62 are satisfied.
3. For limitations on the use of wall and ceiling lining materials see paragraph 58.
4. In the inner rooms no point should be more than 12 m from the nearest exit from that room.

DIAGRAMS 31-33

DUAL-PURPOSE AREAS WITH FIXED PARTITIONS—2

—SERVING ROOMS HAVING AT LEAST TWO SEPARATE WAYS OUT

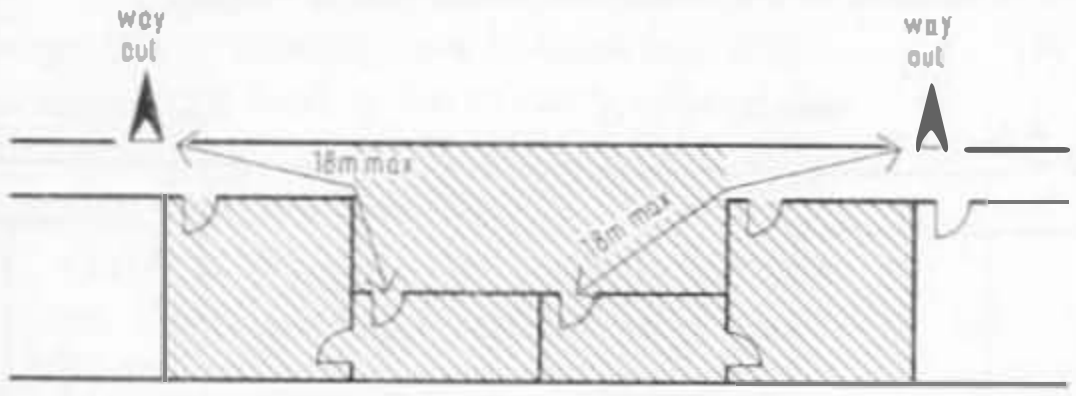


DIAGRAM 31

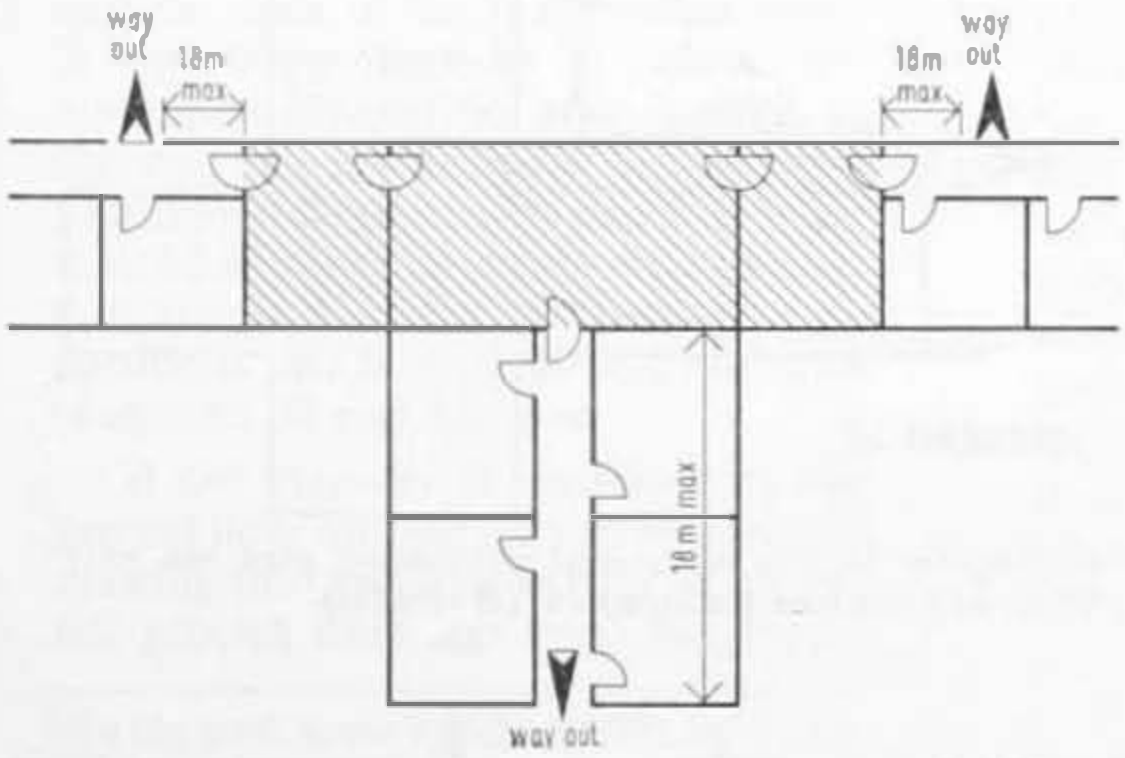


DIAGRAM 32

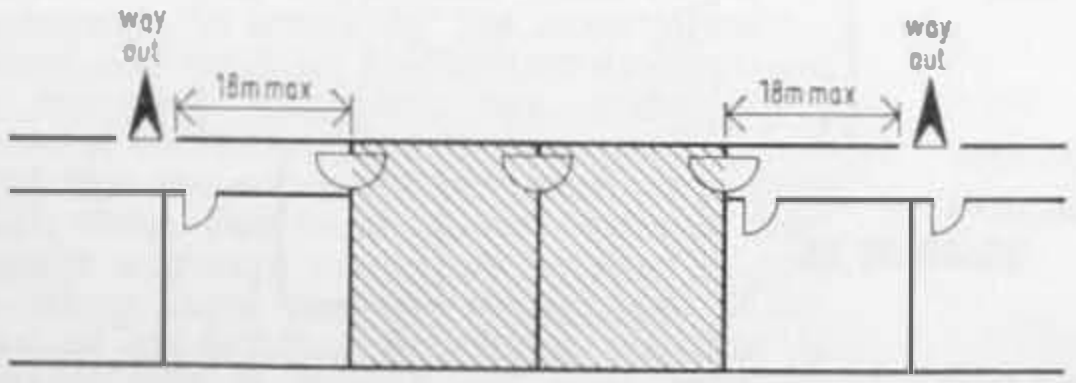


DIAGRAM 33

dual-purpose area

BETWEEN STAIRWAYS OR EXTERNAL DOORS: ANY FLOOR

1. One way out of every room or space within 18 m of nearest stairway or external door.
2. Type 2 fire doors across horizontal circulation area at about 45 m intervals.

NOTE:

1. The dual-purpose areas shown on this page may be areas of high fire risk. (See paragraph 49(3)).
2. None of the limitations shown on this page need apply to the ground floor in any school if the conditions of paragraphs 56 and 62 are satisfied.
3. For limitations on the use of wall and ceiling lining materials see paragraph 58.
4. In the rooms with only one exit, no point should be more than 12 m from the exit from that room.

DIAGRAMS 34-36

DUAL-PURPOSE AREAS WITH MOVABLE PARTITIONS

dual-purpose area

BETWEEN STAIRWAYS OR EXTERNAL DOORS: ANY FLOOR.

1. One door of every room within 18 m of nearest stairway or external door.
2. Type 2 fire doors across horizontal circulation area at about 45 m intervals.

DEAD END: ANY FLOOR.

1. One door of every room within 12 m of nearest stairway or external door.
2. Number of children in rooms opening off a dead end (rooms 1-3 and the dual-purpose area in diagram 35) or a combination of dead ends (cf. diagram 23) is limited to 120.

GROUND FLOOR WITH ONLY ONE EXIT IN SCHOOL OF ANY HEIGHT OR FIRST FLOOR OF 2-STOREY SCHOOL WITH ONLY ONE STAIRWAY.

1. One door of every room within 12 m of stairway or external door.
2. Number of children on the one floor is limited to 120.
3. For the first floor the stairway is arranged on the ground floor as described in paragraph 66(3).

In diagrams 34 and 35 the horizontal circulation areas have at least TWO ways out (see paragraph 57).

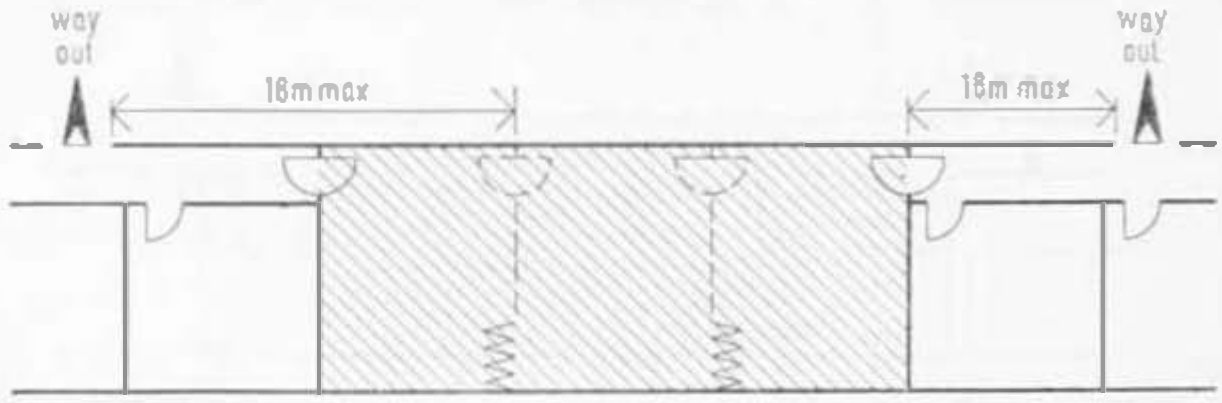


DIAGRAM 34

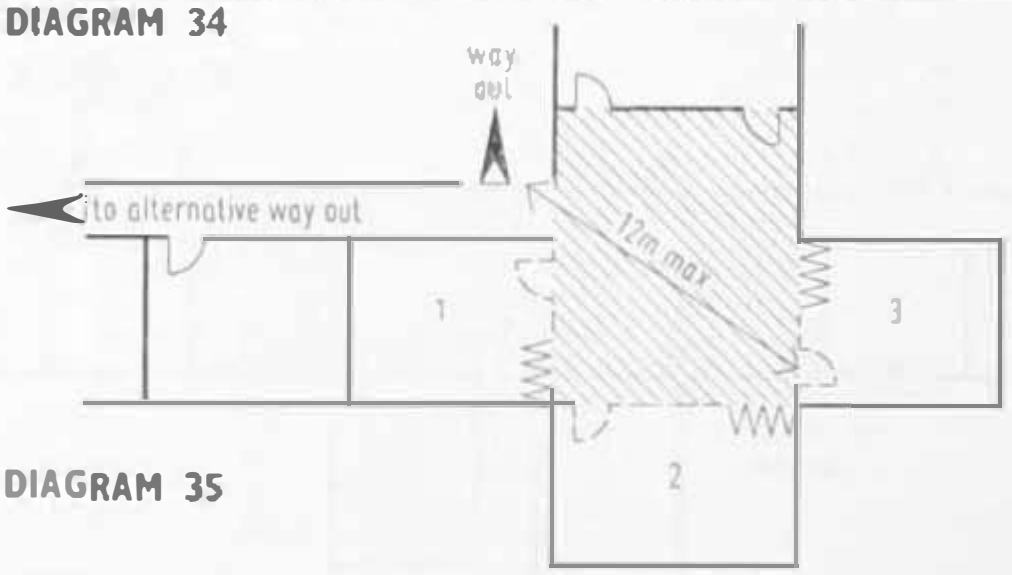


DIAGRAM 35

In diagram 36 the horizontal circulation area has only ONE way out (see paragraph 57(2) and (3)).

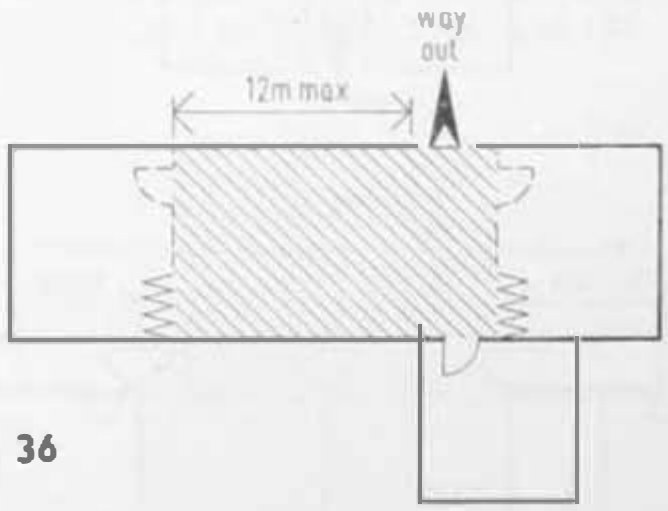


DIAGRAM 36

NOTE:

1. Except on the ground floor (see Note 2 below) the dual-purpose areas shown in diagrams 35 and 36 and any spaces that may be associated with them, should NOT be areas of high fire risk. The dual-purpose areas shown in diagram 34 may be areas of high fire risk on any floor. (See paragraph 49(3)).
2. None of the limitations shown on this page need apply to the ground floor in any school if the conditions of paragraphs 57 and 62 are satisfied.
3. For limitations on the use of wall and ceiling lining materials see paragraph 58.
4. In the rooms with only one exit no point should be more than 12 m from the exit from that room.

STAIRWAYS

The number of stairways[12]

66. All parts of a school above the ground floor should have at least two stairways, except that a two-storey school or two-storey part of a school may have only one stairway provided that:

(1) it is designed to serve not more than 120 children (diagrams 24, 30 and 36); **and**

(2) the distance between the stairway and the door of the furthermost room is not more than 18 m where the horizontal circulation area leading to the stairway is a corridor having fixed partitions (diagram 24), and not more than 12 m where the horizontal circulation area is a corridor having movable partitions or is a dual-purpose area (diagrams 30 and 36); **and**

(3) the stairway is enclosed on the ground floor and the only internal doors opening into the stairway enclosure on the ground floor are from horizontal circulation areas which are not dual-purpose areas, although lavatories may open into a stairway enclosure; **and**

(4) no part of this stairway enclosure is an area of high fire risk, or includes any flame-producing heating apparatus.

67. More than two stairways may be required:

(1) to conform with the recommendations in paragraphs 59(1) and 60(1) about the maximum distance to the nearest stairway in horizontal circulation areas; **or**

(2) to satisfy the recommendations in Tables II, III and IV about the width of stairways in relation to the number of children who will be using them; **or**

(3) to conform with the recommendations in Table I about exits from assembly halls when they are on a floor above the ground floor.

Stairway widths

68. No stairway should be less than 1050 mm wide[13]. No stairway should become narrower in the direction of escape.

[12]In the past, some buildings have been provided with external 'fire-escape' stairways. Experience has shown that these are often vulnerable to attack by fire from adjoining doors and windows, that proper maintenance is frequently neglected, that under some weather conditions they may be unsafe in use and that the occupants are often unfamiliar with them. For these reasons, external fire-escape stairways should not be used in new buildings more than two storeys high. If the use of an external fire-escape staircase is unavoidable it should not pass near to windows, but any window within the following distances of an escape staircase should be fixed shut and glazed with 6 mm wired glass to give at least ½ hour fire resistance: horizontally 1·8 m, vertically downwards 9 m, vertically upwards 1·8 m. The distances should be measured from the nearest tread or landing of the staircase. All doors giving access to the stairs below top level should be ½ hour fire-resisting, self-closing doors.

[13]The widths recommended in Tables II, III and IV will allow a building to be evacuated quickly in an emergency. Architects may consider that these widths would not be enough in all cases for normal day-to-day use (when traffic will often be in both directions at the same time.) It is emphasised that the widths recommended have only been considered for emergency use. Furthermore, in Tables II and III it has been assumed that approximately the same number of children will be using each stairway.

69. In buildings or parts of buildings with two or three stairways interconnected at every floor level by horizontal circulation areas, the minimum width of the stairways, except as mentioned in paragraph 71 should be as in Tables II or III, according to the height of building and the total number of children accommodated above the ground floor.

70. In buildings or parts of buildings with more than three stairways interconnected at every floor level by horizontal circulation areas, the number of children above the ground floor who would normally use each stairway should be estimated, and the minimum width of each stairway, except as mentioned in paragraph 71 should be as in Table IV, according to the height of the building and

Table II—Minimum width of Stairways where there are Two Stairways

Height of building in storeys (from final exit doors)	Maximum number of children on all upper floors*				
2	260	290	330	360	390
3	300	340	380	430	480
4	340	390	440	500	560
5	390	450	510	580	650
6	430	500	570	650	730
7	470	550	630	720	810
8	510	600	690	790	890
9	550	650	750	860	970
10	600	710	820	940	1060
Minimum width of each stairway	1050 mm	1200 mm	1350 mm	1500 mm	1650 mm

*See note at foot of Table IV.

Table III—Minimum Width of Stairways where there are Three Stairways

Height of building in storeys (from final exit doors)	Maximum number of children on all upper floors*				
2	470	520	580	640	700
3	540	610	690	770	850
4	610	700	800	900	1000
5	690	800	910	1030	1150
6	760	890	1020	1160	1300
7	840	990	1140	1300	1450
8	920	1090	1260	1430	1600
9	1000	1180	1370	1560	1740
10	1070	1270	1480	1690	1890
Minimum width of each stairway	1050 mm	1200 mm	1350 mm	1500 mm	1650 mm

*See note at foot of Table IV.

Table IV—Minimum Width of each Stairway where there are more than Three Stairways

Height of building in storeys (from final exit doors)	Maximum number of children using a stairway*				
2	160	180	200	230	260
3	190	220	250	280	310
4	220	250	290	330	370
5	250	290	330	380	420
6	280	330	380	430	480
7	310	360	420	480	530
8	340	400	460	530	580
9	370	430	500	570	640
10	400	470	540	620	700
Minimum width of each stairway	1050 mm	1200 mm	1350 mm	1500 mm	1650 mm

*For the purpose of calculating the widths of stairways and the numbers and widths of exits generally, the number of children in any part of a school should be calculated on the following basis:

Dining Rooms (or areas used for dining) and gymnasia	0·90 m² of floor area per child.
Teaching Rooms	The maximum number of children for which the room is designed.
Assembly Halls	0·45 m² of floor area per child.

For Colleges of Further Education, where room occupancy is generally less than in schools, the number of students may be taken as 80% of the Maximum Student Capacity (MSC) of the accommodation on the upper floors.

All the above stairway widths are compatible with the dimensions recommended in Building Bulletin 42.**

****The Co-ordination of Components for Educational Building* (H.M.S.O., 1968).**

the total number of children above the ground floor who would normally use the stairway.

71. A stairway that serves a part of an assembly hall, but does not also serve some other part of the building, should be at least the width of the assembly hall exit leading to it. If a stairway also serves other parts of the building, its width generally should be determined from Tables II, III or IV, but, from the level of that part of the assembly hall which the stairway serves to ground level, the width of the stairway should in no case be less than the width of the assembly hall exit doors leading to it.

72. Stairways should be clear of all obstructions. Any stairway (but not steps of the kind referred to in paragraph 64) that is more than 1650 mm wide should be divided with one or more handrails, and no part of a stairway so divided should be less than 1050 mm wide. (This means that a stairway that has to be more than

1650 mm wide should be at least 2100 mm wide). There should be a continuous handrail on each side: no handrail should project more than 90 mm into the recommended width, unless the width of the stairway is increased accordingly.

Stairway flights

73. Every stairway should be designed to ensure ease and safety according to the use for which it is designed. No rise should exceed 163 mm and the going should preferably not be less than 280 mm and never less than 250 mm. No flight of stairs should have more than 16 or less than 3 risers.

74. There should not be more than two successive flights without a change of direction. The length of landing between flights, whether there is a change of direction or not, should not be less than the width of the stairway; where doors open onto landings (except at the top of steps or a stairway; see paragraph 87) the doors, when fully open, should not reduce the effective passageway round the landing to less than the width of the stairway (diagram 37). It is desirable that this passageway should not be reduced to less than the width of the stairway by doors during their swing; in no case should it be reduced to less than 900 mm during the swing of the doors (diagram 38).

75. Throughout its entire height every stairway should be enclosed from the ceiling of its top floor to its final exit doors. Stairways in a two-storey school, or two-storey part of a school, which are separated on the ground floor by two separate self-closing, type 2, fire doors, or pairs of doors, one in the enclosing wall of each stairway[14], need not be separated from one another on the first floor; in this case, doors separating ground-floor stairways should be as close to the stairways as is reasonably possible. If the stairways are separated from each other on the first floor, as described above, only one self-closing, type 2, fire door, or pair of doors, is required between any two stairways on the ground floor.

76. The internal and external enclosing walls of every stairway enclosure, and the stairway, landings and floors (excluding floor finish) within the enclosure should be of non-combustible materials, except that, in a two-storey school, the enclosing walls may comply with Table VI. The internal and external enclosing walls should have not less than the period of fire resistance recommended in Table IX.

77. Any glazed screens or fanlights incorporated in the internal walls of a stairway enclosure should have the same fire resistance as is recommended for those walls. Fanlights should be fixed. In buildings or parts of buildings more than four storeys high, glazing should be restricted to the doors into the stairway enclosure (see paragraph 81 below and British Standard Code of Practice 152 for glazing).

78. No part of a stairway enclosure should be an area of high fire risk nor should its use be likely to cause obstruction to persons attempting to escape from the building.

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[14]This recommendation is made in order to prevent stairway enclosures being extended so that they meet one another—a condition which could otherwise easily arise on the ground floor of a school and which should be avoided except in the circumstances described in paragraph 75 as related to a two-storey school.

DIAGRAMS 37-38

ARRANGEMENT OF DOORS OPENING ON TO LANDINGS*

Diagram 37 shows a good arrangement, in which no part of the doors at any time reduces the effective passageway round the landing to less than the width of the stairway.

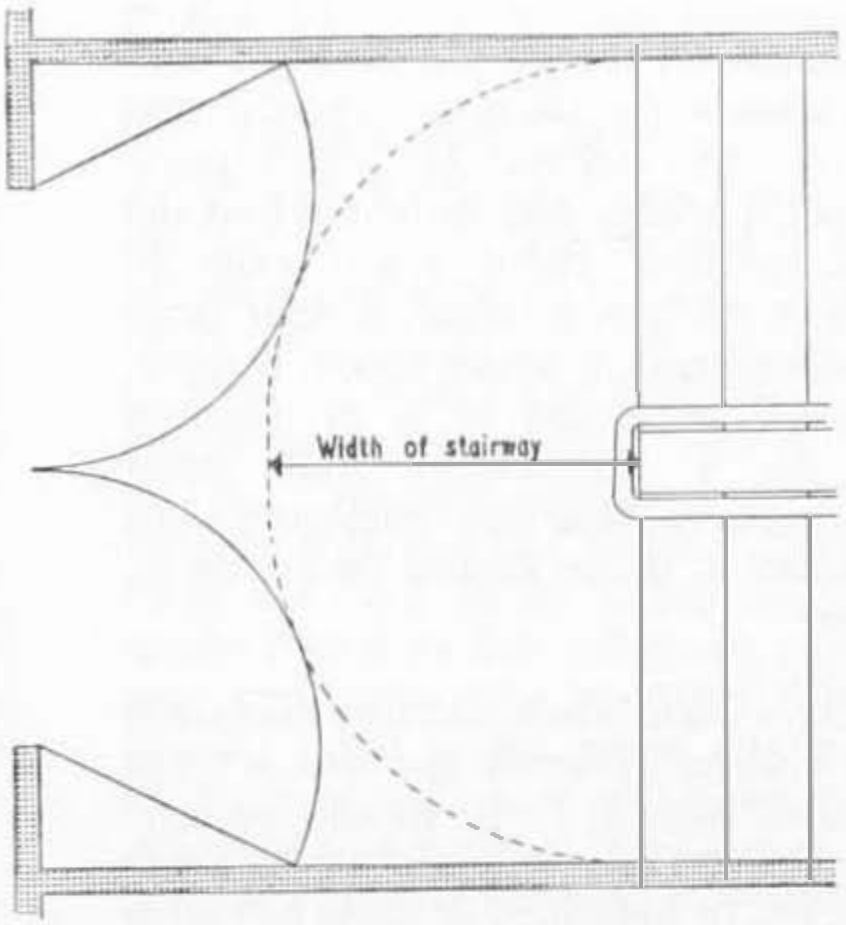

DIAGRAM 37

Diagram 38 shows a different arrangement which may be used where it is necessary to reduce the length of the stairway enclosure to a minimum. The doors when fully open do not reduce the effective passageway round the landing to less than the width of the stairway; the effective passageway is not reduced to less than 900 mm during the swing of the doors.

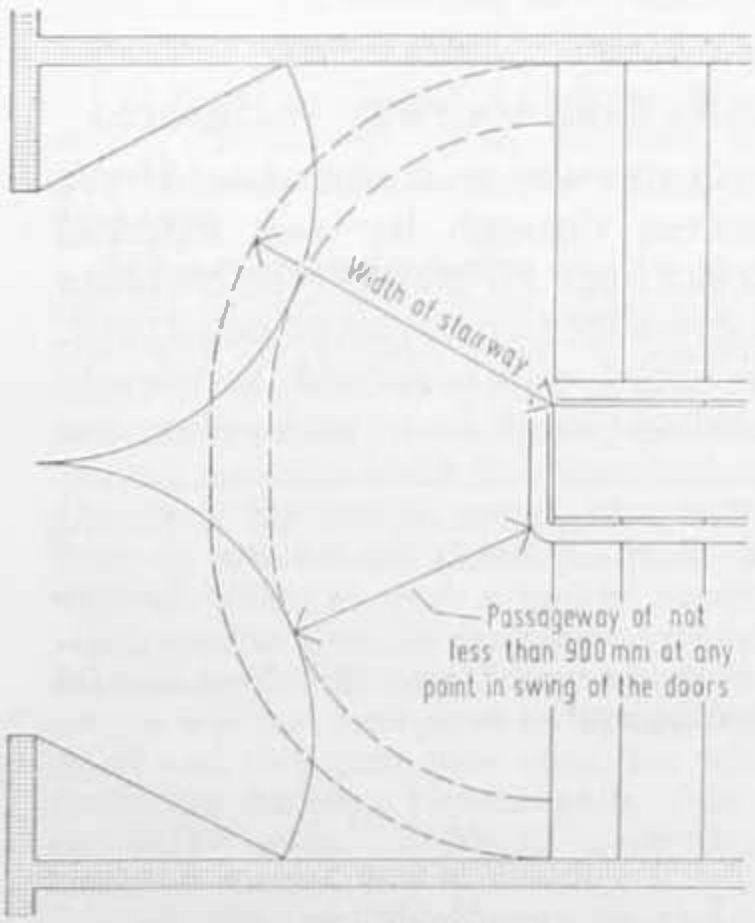

DIAGRAM 38

*Except at the top of steps or a stairway—see paragraph 87.

Openings into stairway enclosures

79. Every opening into a stairway enclosure from within the building should be provided with a door or a pair of doors.

80. Except on the ground floor of two-storey schools (or parts of schools) that have only one stairway (to which paragraph 66(3) refers), and provided that the recommendation about room exits in paragraph 49(2) is satisfied, a door from any room (except a boiler room, a store, a cleaners' cupboard or a preparation room to a laboratory) may open directly into a stairway enclosure, but the number of doors should be as few as possible.

81. Every door into a stairway enclosure from a horizontal circulation area or from an area of high fire risk should be self-closing and of type 2 described in paragraph 19[15]. In buildings or parts of buildings more than four storeys high any glazing in the door should not be less than 900 mm from the floor.

Final exits from stairway enclosures

82. Every stairway enclosure should have direct access through its own external doors to the open air clear of the building and not open into an enclosed courtyard. These external doors should be clearly visible and so placed as to make clear the direction of escape to the open air[16]. There should be no doors across the escape route between the bottom of the stairway and the external doors, other than the internal doors of an external lobby, if provided.

83. External exit doors from every stairway enclosure should, when open, be at least the full width of the stairway and, when they may be used by children leaving both the ground and upper floors, should be wider than the stairway by at least the amount shown in Table V.

Wall and ceiling lining materials

84. The lining materials to walls and ceilings in stairway enclosures should be non-combustible or possess a Class 0 surface (see para 14).

Table V—Additional Width for External Doors Serving Ground and Upper Floors

No. of children from ground floor using doorway*	Minimum addition to stairway width required for external doorway
up to 50	300 mm
51—100	500 mm
101—150	800 mm
151—200	1050 mm

*See notes at foot of Table I and Table IV.

[15]See also paragraphs 88 and 89. It should be noted that, on floors above the ground floor, a room having a door opening directly into a stairway enclosure is likely to be a dual-purpose area, in which case this door should be self-closing and of type 2.

[16]This recommendation is made because, if there is a basement, there is a danger that people may descend below ground-floor level; escape to the open air should be clearly defined at ground-floor level.

DOORS

General recommendations

85. Specific recommendations have already been made about:

(1) the number of room exit doors (paras 49 and 50),

(2) the distance of room exit doors from stairways or external doors (paras 57(1)-(4), 59(1), 60(1) and 66(2),

(3) doors across horizontal circulation areas (paras 59(3) and 60(3)),

(4) doors into stairway enclosures (paras 74 and 79-81), and

(5) ground-floor exit doors from stairways (paras 82 and 83).

Recommendations of a more general nature are contained in the following paragraphs.

86. All doors across escape routes (except from rooms or spaces having less than 50 occupants, calculated according to the notes to Table 1 and Table IV) should open in the direction of escape or swing both ways. Every door opening outwards into a corridor should be arranged so that when open it does not obstruct the corridor. Revolving or sliding doors should not be provided across any escape route.

87. Every door opening on to steps (including any door at the head of a stairway) should have a landing at least 900 mm long between the door in its closed position and the edge of the top step. Where landings are between flights, paragraph 74 will apply.

88. Doors across escape routes should always be capable of being easily opened from the side from which escape is required[17]. A lock, if provided, should not require a key to open the door in any direction likely to be used for escape[18].

89. To be effective, fire doors (see paras 17-19) across corridors and into stairway enclosures should be kept closed, but the practical difficulty of enforcing this may make unavoidable some means of holding these doors open while ensuring that they can be easily and quickly released in case of fire. Wedges should not be used because their use can make it difficult to close the door in an emergency. Doors across corridors but not those into stairway enclosures may be fitted with substantial cabin hooks, fitted upside down for quick operation, or with spring catches, provided that notices: 'Fire Doors: Keep Shut' are fitted in prominent positions, on both sides of the doors. All fire doors should always be closed when the buildings are unoccupied.

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[17] It should be noted that doors across horizontal circulation areas between stairways may require to be used for escape in either direction.

[18] This recommendation will be satisfied in respect of external doors, where locks will generally be needed, if the doors can at all times be opened from the inside either by pressure (as when panic bolts are fitted) or by turning a single knob (espagnolette bolts are one way of securing a pair of doors so that both doors are released by the action of a single knob).

Except in the circumstances described in paragraph 62 external doors from teaching rooms will not form part of a required escape route and therefore they need not satisfy this recommendation. Theoretically this recommendation should apply to other doors from teaching rooms, but in practice it is not considered either practicable or essential to do so, unless they are also dual-purpose areas.

Withdrawn. see Part E of '72 Bldg. Regs.

III. STRUCTURAL PRECAUTIONS TO ENSURE PERSONAL SAFETY

GENERAL REQUIREMENTS

90. The structural precautions considered necessary to help in safeguarding life in schools are:

(1) limiting the use of combustible materials; and

(2) the use of fire-resisting elements of structure; and

(3) precautions to limit the spread of fire from building to building.

Additional precautions to restrict damage to the structure are given in Appendix 1.

91. Combustible materials may be a means of starting a fire, may assist the rapid spread of fire and may add to the intensity of a fire. It is therefore necessary to limit their use, both in the structure and as wall and ceiling lining materials. Indeed, it would be desirable everywhere to use only lining materials that are non-combustible or possess a Class 1 surface, but it is sometimes useful to take advantage of the special characteristics of some combustible lining materials, such as their heat-insulating or sound-absorbing properties; their use must however be limited.

92. Some of the precautions outlined in Part II will restrict the spread of fire along the normal circulation routes. It is also necessary to prevent the early collapse of the building and to restrict the spread of fire through the structure. To these ends, elements of structure such as the walls, floors, columns and beams should be fire resisting, and vertical shafts, such as ducts and lift shafts, unless within a stairway enclosure, should be enclosed by fire-resisting construction.

93. The fire resistance of elements constructed of some of the more common combinations of materials is given in Appendix 3, the classification of various types of wall and ceiling lining materials in Appendix 4 and the designation of various combinations of roof coverings in Appendix 5.

COMBUSTIBLE AND NON-COMBUSTIBLE MATERIALS

Materials of construction other than those used as floor finishes, lining materials or roof coverings

94. The materials of construction, other than those used as floor finishes (see para 96), lining materials (see paras 97 and 98), and as roof coverings (see para 99), should be in accordance with Table VI[19].

Table VI—Combustible and Non-combustible Materials in the Elements of Structure

Height of building or part of building in storeys*	Columns and beams†	External walls† (see para. 76)	Internal enclosing walls of stairway enclosures, lift shafts and other vertical shafts and stairways, landings and floors within stairway enclosures	Floors, internal walls and partitions†	Roofs† (excluding roof coverings)
1	C or N	C or N	—	C or N	C or N
2	C or N	C‡‡ or N	C‡ or N	C or N	C or N
3 and 4	C or N	C‡‡ or N	N	C or N	C or N
5 and over	N	C‡‡ or N	N	N	C or N

C = Combustible materials N = Non-combustible materials

*The number of storeys should include any basement, except that a basement which is used solely as a heating chamber may be discounted.

†In every boiler room attached to a building, including the floor above, the materials forming these elements should be non-combustible.

‡If combustible:—

(1) all wall and ceiling lining materials throughout the building should be non-combustible or have surfaces with Class 0 surface flame spread classification; *and*

‡‡If combustible:—

(1) all wall and ceiling lining materials throughout the building should be non-combustible or have surfaces with Class 0 surface flame spread classification; *and*

(2) the outer cladding of external walls should, if of timber, nowhere be thinner than 12 mm or, if of any other material, should have Class 1 surfaces in the surface spread of flame test; *and*

(3) the fire resistance of the walls should be as recommended in Table IX, but for the purpose of deciding the location of the building the area of combustible walling should be reckoned as window opening.

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[19]Table VI has the effect of permitting the use of combustible materials (i) throughout single-storey and two-storey buildings (except in boiler rooms attached to such buildings); (ii) throughout buildings of three and four storeys in height (except floors over and internal walls to boiler rooms, stairways, floors or landings within stairway enclosures and internal walls to stairway enclosures, lift shafts and other vertical shafts); (iii) in external walls of buildings of any height; subject in all these cases to the limitations imposed by the appropriate footnotes; and (iv) in roofs of buildings of any height. It is also intended that items such as doors, doorframes and architraves, window frames, skirtings, dado and picture rails, and other small sections such as handrails, chalk-boards, etc., may be combustible. Otherwise non-combustible materials are recommended.

Fire-stopping in hollow construction

95. Any cavity in walls, partitions, floors or flat roofs, in which there is exposed a combustible material with a surface spread of flame of Class 2 or 3, should be fire-stopped at every junction of the walls, partitions, floors and roofs, to minimize the rapid spread of fire. These cavities should also be fire-stopped at intervals of not more than 7·5 m in every direction. Fire stops should preferably be of non-combustible material such as plasterboard or mineral wool mat, but timber at least 40 mm thick or other materials which give an equivalent degree of protection may be used. Members of any framing within the hollow wall, partition, floor or suspended ceiling may themselves form the fire stops if they conform with these recommendations. Care should be taken to form fire stops around any pipe which passes through the structure surrounding the cavity. Combustible pipes and ducts, including ventilation systems, may require special treatment. Class 4 materials should not be exposed to air in any cavity or void where they could propagate fire.

Floor finishes

96. Floor finishes in schools of any height (including the floor finishes to steps and landings in stairways) may be combustible or non-combustible.

Wall and ceiling lining materials

97. Appropriate lining materials to walls, partitions and ceilings in the various parts of an escape route have been recommended in Part II, paragraph 58, in respect of horizontal circulation areas, and paragraph 84, in respect of stairway enclosures. There should be no Class 4 surfaces exposed to air anywhere in the accommodation.

98. In all parts of schools other than those covered by paragraph 97, lining materials to walls, partitions and ceilings should be either non-combustible or limited to those recommended in Table VII. If the height of a school varies from one part to another, the wall and ceiling lining materials throughout the school should be limited to those recommended for the highest part; except that, if the lower part is separated from the higher part by a wall having a fire resistance of at least ½ hour and all the openings in the wall are fitted with type 2 fire doors, the wall and ceiling lining materials in the lower part may be those recommended in Table VII according to the height of that part.

Table VII—Combustible Lining Materials to Walls, Partitions and Ceilings

Height of Building in storeys	Area	Recommended *Minimum* classes of surface spread of flame
Any height	Horizontal Circulation areas	Class 0
Any height	Stair enclosures	Class 0
Any height	Assembly hall: Stage	Class 1
	Areas other than stage	Class 1, except that Class 3 surfaces may be used for not more than 50% of total wall and ceiling area
1	Areas of high fire risk, stores	Class 1
	Areas not otherwise mentioned	Class 3
2, 3 and 4	Areas of high fire risk, stores	Class 1
	Areas not otherwise mentioned	Class 1, except that *either* Class 2 surfaces on walls *or* Class 3 surfaces on ceilings may be used
5+	All areas not otherwise mentioned	Class 1 *except* that Class 3 may be used on top floor ceilings

Notes:

1. Fire Note No. 9 of the Joint Fire Research Organization (H.M.S.O. 1966) gives the flame spread classifications for various types of materials. Class 0 is defined in Regulation E14 of the Building Regulations 1965 or subsequent amendment.

2. The flame spread classification of a material's surface may be altered either by impregnation or the application of a finish, such as paint or paper. The application of some treatments may improve the standard of a material's surface in respect of flame spread. There is some evidence however that materials whose surfaces are only able to achieve a particular classification by the application of a treatment do not behave as well in fire as those which have the same classification 'inherently'.

3. Where Class 0 is recommended in this edition of the BULLETIN a material which is 'inherently Class 1' may be used. To achieve 'inherent Class 1' all treatment must be part of the process of manufacture and all surfaces and cut edges of the material must achieve Class 1.

4. Whether lining materials are treated or not, the subsequent application of a combustible decorative finish which would result in the final surface flame spread classification of the lining being lower than that recommended in this BULLETIN should be avoided (e.g., expanded polystyrene should never be painted with gloss paint).

Roof coverings

99. An important function of roof covering materials is to retard the penetration of fire into the building from outside. To achieve an acceptable standard in this respect roof coverings should be used in accordance with their designation and the appropriate conditions shown in Table VIII.

Table VIII—Roof Coverings

Designation of roof covering	Conditions governing use
AA AB AC	No restrictions
BA BB BC	Any part of a roof so designated should be not less than 6 m from any point on a boundary.
AD BD CA CB CC CD	Any part of a roof so designated should be not less than 12 m from any point on a boundary unless such part is:— a. of an area not exceeding 2·8 m², b. separated from any other part of the same roof so designated by an area of roof at least 1·5 m wide covered by a non-combustible material, in which case such designated part should not be less than 6 m from any such point.
DA DB DC DD	Any part of a roof so designated should be:— a. not less than 23 m from any point on a boundary, and b. of an area not exceeding 2·8 m², and c. separated from any other part of the same roof so designated by an area of roof at least 1·5 m wide and covered with non-combustible material.

FIRE-RESISTING CONSTRUCTION

Standards of fire resistance

100. In single-storey schools or single-storey parts of schools the elements of structure need not possess any specific degree of fire resistance, but attention should be paid to Appendix 1.

101. In schools or parts of schools more than one storey high the elements of structure listed in Table IX should have a fire resistance not less than is recommended in that Table, as appropriate to the height of the building.

102. In schools or parts of schools more than four storeys high, metal columns and beams should be encased individually[20].

103. Every boiler room should be separated from all other parts of the building by construction having a fire resistance of at least 2 hours. Where a boiler room is adjacent to a building more than four storeys high, all the elements of the boiler room's construction (including its roof if it adjoins a higher building) should have a fire resistance of at least 2 hours and be non-combustible.

Any internal oil storage must be in a completely separate compartment with a catch pit which is imperforate.

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[20]Metal columns and beams may be protected in two ways. In the first, each member is separately encased by protective material; in the second, the members are separated from the inside of the building by the protective 'membrane' of a wall or a ceiling, but are not separately or completely encased. The second method may be the more economical, besides being quicker and easier to build; it may also save weight. It has, however, the serious disadvantage that, to be effective, the protective membrane must be continuous and imperforate (except that a limited number of small holes are permissible for connections for light fitting, etc.). Thus the use of a membrane to protect columns and beams necessitates a high standard both of detailed design and of site supervision.

Table IX—Minimum Standard of Fire Resistance to Internal Fire

Height of building or part of building in storeys*	Minimum fire resistance (in hours) of main elements of structure					
	Internal load-bearing walls	External walls if not protecting the structural frame‡	Internal enclosing walls to stairway enclosures, and to lift shafts and other vertical shafts outside a stairway enclosure	Floors	Columns and beams above the floor level of top storey†	All other columns and beams
1	Nil	Nil	—	Nil	Nil	Nil
2	½	½‡‡	½	½††	½††	½††
3	½	½‡‡	½	½	½**	½
4	½	½‡‡	½	½	½**	½
5 and over	1‡‡‡	1‡‡ ‡‡‡	1‡‡‡	1‡‡‡	½**	1

*The number of storeys should include any basement, except that a basement which is used solely as a heating chamber may be discounted.

†No part of any roof structure, including any beams in it and the ceiling of the top storey, need have any special degree of fire resistance.

‡All external walls which are within 1·2 m of a site boundary (other than adjoining a road) should have a fire resistance of 1 hour from each side and be imperforate. All structural members helping to support such walls should also have a fire resistance of 1 hour. All other external walls in buildings of more than one storey need only have the full period of fire resistance against collapse and flame penetration from inside the building, together with a period of only 15 minutes for temperature rise on the outside face.

‡‡External walls need have no specific period of fire resistance provided that the wall is entirely of non-combustible materials, is regarded as consisting entirely of window openings and the distance from the nearest site boundary is increased in accordance with the appropriate figures recommended in Table X for a building with more than 50 per cent window opening.

††Structural steelwork of heavy section (as defined in paragraph 16) may be unprotected throughout, and columns and beams of any kind may be unprotected above the floor level of the top storey, provided that in either case:

(1) they do not form part of a stairway enclosure; and

(2) all the elements of structure are of non-combustible materials; and

(3) the lining materials to walls, partitions and ceilings are either non-combustible or limited to those having a Class 1 surface.

**Above the floor level of the top storey, structural steelwork of heavy section may be unprotected provided that:

(1) it does not form part of a stairway enclosure; and

(2) all the elements of structure are of non-combustible materials; and

(3) the lining materials to walls, partitions and ceilings are either non-combustible or limited to those having a Class 1 surface.

‡‡‡Above the floor level of the top storey no element of structure need have a fire resistance of more than ½ hour.

See also Appendix 1 for additional precautions to restrict structural damage.

LOCATION OF BUILDINGS

104. In order to reduce the risk of spread of fire between buildings, all schools should be sited so that the distance between the external wall and the nearest site boundary is not less than the distance shown in Table X according to the dimensions of the wall and the percentage of window area; except that an external wall may be less than 1·2 m from a site boundary if it adjoins a road (in which case the distance should be measured from the centre line of the road) or if it is imperforate and has a fire resistance of at least 1 hour.

105. Where the fire resistance of the external wall is less than is shown in Table IX, the area of this part of the wall should be added to the area of window opening for the purpose of deciding the minimum distance from the site boundary in accordance with Table X.

106. Where combustible cladding or other combustible materials are used for an external wall, the area of this part of the wall should be added to the area of window opening for the purpose of deciding the minimum distance from the site boundary in accordance with Table X. (This is in addition to complying with the recommendations contained in note ‡‡ to Table VI, and in Table IX).

Table X—Distances from the Site Boundary of External Walls

Height of wall not exceeding (m)*	Length of wall not exceeding (m)*	Minimum distance (m) from external face of wall to boundary† when proportion* of openings in wall is:—			
		Less than 20%	20%–30%	30%–50%	50% or more
7·5	12	1·5	2·7	4·3	6·4
	24	1·8	3·4	5·2	8·5
	36	1·8	3·4	5·8	9·8
	48	1·8	3·4	6·1	10·7
	exceeding this	1·8	3·4	6·1	11·3
15	12	2·1	4·0	6·1	9·1
	24	2·7	5·2	8·2	12·6
	36	3·4	5·8	9·5	15·2
	48	3·4	6·4	10·4	17·1
	exceeding this	3·4	6·4	11·0	18·3

*In determining the height and length of the wall and the proportion of openings in it, only that part in which openings occur should be considered. For this purpose the wall should be regarded as a rectangle with horizontal and vertical sides, being the smallest rectangle which will enclose every opening in the wall. Any opening which forms part of the external wall of a stairway enclosure may be disregarded. Where the fire resistance of the floors is not less than 1 hour, only the two adjacent storeys in which the greatest proportion of openings occur need be considered; the rectangle will then be that enclosing all the openings within those two storeys. In this Table 'opening' also includes any areas of non-combustible wall having less fire resistance than is recommended in Table IX, and any areas of wall having combustible cladding or containing combustible materials.

†Where the external wall is in more than one vertical plane, the distance should be measured from that part of the wall which is nearest the site boundary. Any setback or recess of 1·5 m or less should be disregarded; any setback or recess of more than 1·5 m may be considered as a separate wall. Where the site boundary adjoins a road, the distance may be measured as if the centre line of the road was the site boundary.

See also Appendix 1 for Buildings on the same site.

IV. FIRE-WARNING SYSTEMS

GENERAL REQUIREMENTS

107. An audible fire-warning system should be provided in every school as the first link in the chain of precautions. The occupants must be warned quickly of any outbreak so that they can leave the building without delay.

108. There are three main types of warning system:—

(1) Hand-operated fire-bells or sounders mounted at suitable points in the building. These are the cheapest to install and the simplest to operate. They need no maintenance but have a disadvantage; a warning, once given, should continue until everyone is out of the building, and with hand-operated bells this may not be possible. Any one sounder should be audible throughout the building.

(2) Electric bells actuated manually from one or more call-points. Provision should be made so that the warning, once actuated, continues to sound automatically. Modern systems of this kind overcome both the disadvantages described in (1) above, but are more expensive to install and maintain.

(3) Electric bells actuated by some kind of automatic detector. These may also be incorporated in the system described in (2) above. Automatically actuated systems are usually installed in buildings only where a fire might otherwise burn undiscovered for some time. The installation of such systems will have to be justified in each case.

109. Provision might be made at additional cost with the electric-bell system mentioned in (2) above for a simultaneous call to be put through to the fire brigade when the alarm system is actuated.

110. The same type of system should be used throughout all parts of a school and each category of equipment should be standard throughout the school, and, if possible, throughout a local authority's area.

111. The size of the building, both in height and area, will determine which type of system should be installed. Manually-operated electric systems will normally be preferable in buildings more than two storeys high. Such a system will need to be installed throughout a building of which part is on several, and part on one or two, storeys.

112. In schools which consist of several separate buildings, the same system should be installed in all parts, but the system in each separate building may be self-contained, so that an alarm may be sounded in one part without automatically operating throughout the rest of the school.

113. Whatever type of system is installed, whether intermittent or continuous sound, it should differ from any other signal used in the school and preferably should not be used for any purpose other than that of sounding a fire warning. When sounded, it should be capable of being heard above any other noise likely to be going on.

INSTALLATION OF FIRE-WARNING SYSTEMS

114. Precise recommendations cannot be made in this BULLETIN about the type of fire-warning system to be installed in a particular school or about the method of installing it, since a satisfactory solution in any one case will depend largely upon the design of the school and the nature of the escape routes from it, provided in accordance with Parts I and II. Designers are recommended to discuss the question with the Chief Fire Officer of the appropriate Fire Authority.

Type of system

115. In schools of one or two storeys, with less than 350 children, a system of hand-operated fire-bells or sounders will be sufficient, provided that any one sounder is audible throughout the premises.

116. In schools of which any part is more than two storeys high, an electric warning system will normally be required, to be manually operated from call-points of the kind described in paragraph 120.

117. Power for electric systems should be supplied from batteries maintained at full charge by trickle charging, or from some other source independent of the public electricity supply.

Call-points and bells[21]

118. Call-points should be in prominent positions preferably on escape routes and should be placed so that the walking distance to the nearest call-point is nowhere more than 30 m.

119. There should be at least one call-point on every floor. A call-point should be provided close to every kitchen, laboratory, workshop, housecraft and craft room, and the stage of every assembly hall.

120. Call-points for electric systems should preferably be of the 'break-glass release' type; it should, however, be possible to sound the warning for practice purposes without breaking the glass.

121. Indicator boards, which show the call-points from which the warning has been given, will rarely be necessary in schools.

122. Bells, actuated from a call-point, should be provided so that they can be heard in every part of the building. Small bells closely spaced are preferable to a small number of large bells.

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[21] Where hand-operated fire-bells are provided, the bell serves the function both of call-point and bell, and should therefore satisfy the recommendations of paragraphs 118 and 119.

V. FACILITIES FOR FIRE FIGHTING

FIRE FIGHTING BY THE FIRE BRIGADE

123. Parts I-IV of this BULLETIN have been concerned with measures of 'passive defence' against fire. It is also necessary to consider what active measures are required to assist the fire brigade and the school's occupants to combat the spread of fire.

124. The Chief Fire Officer should always be consulted early in the planning stage about facilities for fire fighting by the fire brigade. Local conditions may differ from area to area, but the following facilities will normally be needed and should, in most cases, satisfy the requirements of the fire brigade:—

(1) *Means of access to the building.* When the building is some way back from the public highway, road access for motor fire appliances will be necessary. Any entrance through which appliances may need to pass should be a clear 3 m in width and there must also be adequate space to enable appliances to turn into an entrance. A wheeled escape can be manhandled over fairly firm ground when dismounted from its carrier, but for it to be used at all heights up to its maximum it is desirable that there should not be any obstructions within 6 m of the building.

(2) *Water supply.* Where there is a good supply of water available in public mains, it may still be necessary to install one or more hydrants on the site if the building is set far back from the road. The fire brigade should not normally have to lay more than 91·4 m of hose and, as this figure includes the distance to the top floor, the distance of the building from the nearest hydrant must allow for this[22].

(3) *Internal equipment.* Internal hydrants or dry risers will not normally be required in schools unless the building is more than four storeys in height or there are special circumstances.

[22]If the public water supply is limited, it may be necessary to make special arrangements. With little expense, natural sources can often be utilized if preparations are made beforehand.

FIRE FIGHTING BY THE SCHOOL'S OCCUPANTS

Types of equipment

125. Fire-fighting equipment is needed in schools, but it should be strictly limited to what is necessary and to what can be used effectively with little training[23]. The usual types of equipment are:—

(1) *Hosereels* may be considered by the Chief Fire Officer to be essential, especially in larger buildings, as an alternative to water (gas-expelled) or soda-acid extinguishers.

(2) *Portable fire extinguishers* may prove to be the most satisfactory means of dealing with the types of fires generally met with in smaller schools. Such fires fall into two categories; those involving ordinary combustible materials such as wood, paper and textiles, and those involving flammable liquids such as oils, solvents used in

[23]A teacher's first duty in case of fire is, of course, to look after the children and he should not, therefore, attempt any fire fighting until their safety has been ensured.

chemistry, and cooking fat. For dealing with the first of these, either water (gas-expelled) extinguishers (which only expel water) or soda-acid extinguishers (which expel mainly water) are suitable. For fires involving flammable liquids either foam, dry powder or carbon dioxide extinguishers may be used: in this case there should be no water (gas-expelled) or soda-acid extinguisher because of the possibility of their use on outbreaks for which they are unsuitable[24].

(3) *Buckets of sand* are useful in a laboratory when provided in conjunction with a portable fire extinguisher, since nearly every kind of outbreak likely to occur in a laboratory can be dealt with by one or the other.

(4) *Buckets of water* are the cheapest type of equipment. They are, however, undesirable in every other way; they usually become dirty, they are liable to be misused and the water evaporates. Furthermore, their value in fire fighting is limited; the bucket must be carried close to the fire before being used, is emptied in one throw and the water cannot be directed with any accuracy.

(5) *Blankets* are invaluable in dealing with people whose clothes are alight; they should be wrapped and rolled in a blanket. Blankets can also be used to smother small fires in cooking fat and other flammable liquids. Blankets should be of either asbestos or glass fibre, should be about 1·37 m square if of asbestos, and should preferably be kept in cylindrical metal containers fixed to the wall, 1·5 m from the floor to the bottom access of the container.

126. Wherever possible, each item of fire-fighting equipment should be standardized throughout a school.

Installation of equipment

127. As in the case of fire-warning systems and facilities for fire-fighting by the fire brigade, the Chief Fire Officer should be consulted about the nature and installation of fire-fighting equipment in particular cases, especially in high buildings. The following recommendations are made as a general guide.

128. Hosereels may need to be installed in larger schools or where there are special risks.

129. Schools may be equipped with portable fire extinguishers of the water (gas-expelled) or soda-acid type, except where foam, dry powder or carbon dioxide extinguishers are recommended in Table XI.

130. One extinguisher of the appropriate type should be provided in each position as in Table XI. Water (gas-expelled), soda-acid and foam extinguishers should be of about 2 gallons capacity and dry powder should be of about 1 kg capacity. Carbon dioxide should not be of less than about 1 kg capacity in laboratories and housecraft rooms, and not less than about 2 kg capacity in kitchens. All appliances should be in accordance with the appropriate British Standard.

131. In addition to the extinguishers provided in accordance with Table XI, water (gas-expelled) or soda-acid extinguishers should be provided throughout the building so that the walking distance

[24] In some laboratories where very volatile liquids are used or fragile equipment is installed, dry powder or carbon dioxide extinguishers may be preferable to foam.

In schools, carbon-tetrachloride, methyl bromide or other extinguishers which may produce a toxic gas should never be used.

to the nearest of these extinguishers does not exceed 30 m from any point. Extinguishers should be of about 2 gallons capacity and should be placed on escape routes; if in a room, the extinguisher should be near the door. There should be an extinguisher adjacent to every fire warning call-point. A shelf or bracket should be provided for every extinguisher so that the top is about 1·4 m above the floor level. (The recommendations about the placing of extinguishers also apply in general to the extinguishers mentioned in Table XI).

132. Two buckets of sand should be provided in every laboratory.

133. An asbestos or glass-fibre blanket in a suitable container fixed to the wall should be provided, adjacent to the fire extinguisher, in every kitchen, laboratory, housecraft room, pottery craft room and metal workshop, and on the stage of every assembly hall. (Where a movable stage is provided, the blanket and container should be in the most suitable position in the assembly hall).

Table XI—Installation of Fire Extinguishers in Areas of High Fire Risk

Location	Type of extinguisher
Every craft room Every workshop Stage of every assembly hall	Water (gas-expelled) or soda-acid
Every laboratory* Every housecraft room† Every kitchen†	Foam or dry powder or carbon dioxide
Every boiler room where oil fuel is used	Foam

*See Note 24, paragraph 125(3).

†Where there is no fixed frying equipment, a dry powder or carbon dioxide extinguisher may be preferable to foam. These last two types of extinguishers also have the characteristic of being non-conductors of electricity, which may sometimes be advantageous.

VI. PRECAUTIONS BY THE OCCUPANTS

134. The recommendations in this BULLETIN should be read in conjunction with those contained in Educational Pamphlet No. 53 *Safety at School*. The Fire Brigade should be called to any fire, however small.

135. Parts I-V of this BULLETIN have been written primarily for the architect who is designing schools, but he is not the only person who can influence the safety of the building's occupants; any building can quickly become dangerous unless there is some foresight and attention to detail in its day-to-day use. Only the occupants and those responsible for them can ensure that the building continues to be safe, and that the occupants know what to do if there should be a fire. Most important is to ensure that periodic fire drills (by which is meant practice evacuations of the building, not fire-fighting practice) are carried out in every school, though this is a matter outside the scope of this BULLETIN. The following points are some of those which merit attention.

Stairways and doors

136. Stairways and exit doors must never be obstructed, and all exit doors must be capable of being opened easily and immediately from the inside while there is anyone in the building. Stairways and exit doors should be kept in good repair. No combustible material should be stored or allowed to accumulate in the stairway enclosures. Ideally, doors across escape routes should not be fitted with locks, but, where they are fitted, it is essential that they should be kept unlocked with the key removed the whole time the building is occupied.

137. The purpose of type 2 fire doors into stairway enclosures and across escape routes, and the importance of closing them quickly in the event of a fire in any part of the building, should be explained to all the occupants of a school. It is desirable that these doors and all type 1 fire doors should be closed at night and during weekends and holidays so that, if there is an outbreak of fire, its spread will be reduced and the damage by smoke contained.

Rubbish and combustible waste

138. Rubbish and combustible waste matter should not be allowed to accumulate, particularly in laboratories, workshops, craftrooms and boiler rooms. Such material should be put in a metal or other non-combustible container and properly disposed of as soon as possible.

Interconnected and open-plan areas

139. In large open-plan rooms great care must always be taken to ensure that no equipment, materials, fixed or loose furniture should be allowed to obstruct the easy passage of pupils to the exits.

Periodic inspections

140. The Chief Fire Officer should be consulted about periodic inspection of school premises by Fire Brigades Officers or other responsible persons to ensure

that escape routes are properly available and no fire hazards have been introduced. Headteachers may wish to designate one person to take a special interest in fire safety, particularly the possible hazards and the necessary precautions.

Guards

141. Every open fire (gas, electricity or solid fuel) must be provided with an efficient type of fire guard. Other heating appliances, such as convectors and storage heaters, may require protection to ensure that they are not misused. Regular maintenance is strongly recommended.

Temporary displays and decorations

142. Great care must be taken when using paper or flimsy materials either for decorations or for costumes, especially where heating is by any kind of open fire. Such decorations, and also evergreens, should not be suspended from light fittings; fire occurring in suspended, and highly flammable, materials spreads rapidly, and blazing pieces may drop over a wide area before everyone in the room has a chance to escape. Cotton wool should never be used for these purposes.

143. Fancy dresses and costumes are often by their very nature highly flammable and the greatest care should be exercised when school plays or parties are being held. At such times open and portable fires must be adequately protected with fire guards, and, in order to minimize the risk of dresses and costumes catching alight, mirrors should not be placed above fires in 'dressing rooms'.

Laboratories

144. The precautions against fire that should be taken in laboratories are dealt with in *Safety at School*, Chapter 3.

145. Hazardous experiments and demonstrations should not be carried out near the door of a laboratory or workshop.

146. Unless a separate store, detached from the main building, is provided, the amount of petrol and other flammable liquids stored on the premises should be severely limited. With petrol, there is a statutory requirement[25] that, unless its storage has been licensed by the local authority (who may attach to the licence such conditions as they consider appropriate) not more than 14 litres in the aggregate may be stored, in separate containers each containing not more than 0·5 litres.

Housecraft rooms

147. Electric irons should be provided with pilot lights and with efficient stands in case they are left switched on; metal stands are acceptable if air can circulate below them, but thick asbestos mats are better. Flexible cable is frequently damaged by being put away wound round an iron that is still hot; irons should be allowed to cool down before being put away. Attention might be drawn to this point by suitable notices in housecraft rooms.

Electrical supply and fittings

148. Fuses that have blown must only be replaced with fuse wire of the correct rating, never with wire of a higher rating or, as sometimes happens, with thick copper wire. Flexible cable to fittings should be as short as possible and should be inspected regularly and replaced

[25] By virtue of the Petroleum (Consolidation) Act, 1928 (18 and 19 Geo. 5 Ch. 32) H.M.S.O. Attention is also drawn to the Petroleum (Consolidation) Act—Home Office Model Code of Principles of Construction and Licensing Conditions, Part I. H.M.S.O., 1968.

immediately if worn. Additions or alterations to wiring should be undertaken only by a competent electrician (work of this kind on electrical circuits and equipment used for teaching purposes can, however, be carried out by the teacher in charge). Special care should be taken when fairy lights or other types of lighting are used for decorative purposes.

Fire-warning systems

149. Electric fire-warning systems should be tested once a week, and any faults should be rectified immediately.

Fire extinguishers

150. Fire extinguishers should be maintained and recharged according to the manufacturer's instructions. When in position they should be well away from any fire, radiator or heat-producing appliance and should not stand in direct sunlight. Spare extinguishers and refills should be stored in a cool dry place and never in storerooms attached to classrooms[26].

Curtains, furnishings, etc.

151. Care should be taken that curtains, furnishings, educational and display materials, which may be added to the building by the occupants, do not constitute a particular fire hazard. Where possible, fire-retardant treated materials should be used.

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[26]B.S.C.P. 402: Part 3: 1964—
Fire-fighting installations and equipment—Portable fire extinguishers for buildings and plant.

APPENDIX 1

ADDITIONAL PRECAUTIONS TO RESTRICT STRUCTURAL DAMAGE

1. The fire precautions recommended in the main body of this BULLETIN are confined to those considered essential for safety of life. In most instances they will also help considerably in limiting damage to the structure in the event of fire. Recently there has been an increase in the cases of arson at times when buildings are unoccupied. This has often resulted in considerable damage because of delay in raising the alarm, and in some cases because the materials were readily ignited. Additional precautions to reduce the spread of fire and consequent loss of property and dislocation of school activities can often be taken at small cost.

Single-storey schools

2. Although Table IX does not require any standard of fire resistance for single-storey buildings, consideration should always be given to providing at least ½ hour fire resistance in the main elements of structure in order to restrict the rapid extension of a small fire. In addition, single-storey schools should be sub-divided into separate volumes not exceeding about 1700 m³, either by building them in separate blocks or by inserting compartment walls as described in paragraph 4 of this Appendix. Where combustible cladding is used and compartment walls are situated near re-entrant angles formed by the external walls, it would be advisable to use non-combustible materials for the external cladding of the adjacent walls for a sufficient distance along them to prevent fire spreading from one portion to the other. Similarly, non-combustible materials should be used for the external cladding of walls facing one another where there would otherwise be the danger that fire might spread across the intervening space. (See also Table VI and footnotes (page 37). where it is recommended that, in special circumstances, these requirements should be met in multi-storey buildings.)

Multi-storey schools

3. Schools with floors having a fire resistance of less than 1 hour should be subdivided by compartment walls into separate volumes not exceeding about 7,000 m³. The compartment walls should be as described in paragraph 4 of this Appendix.

Compartment walls

4. The compartment walls mentioned in paragraphs 2 and 3 of this Appendix should be continuous from foundations to roof and from external wall to external wall. A compartment wall should be pierced by as few openings as possible on each floor and all openings should be provided with fire doors, type 1. In the roof space, compartment walls should be taken up through the floor and roof spaces to the underside of the roof covering, and in these spaces they should be imperforate. (It is not the intention of this recommendation to prevent service pipes being taken through compartment walls; any hole through which a pipe or conduit passes should, however, be closely sealed round the pipe or conduit.) A compartment wall should be non-combustible and have a fire resistance of not less than 1 hour.

Floor and roof spaces

5. In paragraph 95, recommendations are made for fire-stopping in voids in roofs and above suspended ceilings which incorporate combustible material with a greater surface spread of flame than Class 1. To restrict structural damage where the voids incorporate any other combustible material it is recommended that fire stops be provided at intervals of not more than 30 m. Unless the ceiling has a standard of fire resistance of at least ½ hour, it is important to place the fire stops above partitions on the floor below.

Columns and load-bearing walls in three and four-storey buildings

6. In three- and four-storey buildings the fire resistance of columns and loadbearing walls supporting more than one storey should be not less than 1 hour.

Separation of buildings

7. Where a school consists of a number of separate buildings on the same site, the distance between any two of them should not be less than the greater distance required from a site boundary by Table VIII or Table X, whichever is the greater.

APPENDIX 2

Table XII—Number of fires in all educational establishments in England and Wales reported to Fire Brigades

Year	Day Schools only	Other Establishments	Total
1958	500	150	650
1963	590	280	870
1964	570	280	850
1965	621	299	920
1966	690	340	1030
1967	732	413	1145
1968	852	564	1416

1. Up to 1958 the number and pattern of fires in educational buildings was fairly constant, but since 1964 a steady increase in the numbers of fires in both day schools and other educational establishments is apparent. The causes of fire are mainly those common to dwellings: fires due to heating and cooking appliances and smokers' materials, etc. Children playing with matches is another common cause. In recent years there has been a very noticeable increase in arson, which is often a difficult cause to establish, and in these fires there is more extensive structural damage than in accidental fires.

2. A large proportion of the fires in schools are extinguished before the arrival of the fire brigade, indicating that in these cases the fires were easily dealt with and, although any fire at all in buildings such as schools must be considered as a possible hazard to life, the casualties which have occurred have been few and slight.

Table XIII—Number and Supposed Causes of Fires in Schools in England and Wales reported to Fire Brigades

	Day Schools		
	1958	1962	1968
Heating Appliances	120	126	100
Cooking Appliances	24	44	88
Wire and Cable	24	36	44
Smoking materials	40	75	88
Children with matches	52	46	88
Other causes including Electricity and Gas appliances other than above:			
Spontaneous combustion			
Soot and flues			
Miscellaneous	188	133	164
Malicious ignition	—*	53	156
Unknown	52	119	124
Total	500	632	852

*Not separately recorded, but included in other causes for 1958, probably about 25.

Between 1950 and 1964 the annual increase in the number of fires in educational buildings has been comparable with the annual increase in number of fires in all other types of buildings in the U.K. However, since 1964 the number of fires in educational buildings has increased at a much faster rate than the national average. The most significant cause has been malicious ignition.

APPENDIX 3

FIRE-RESISTANCE ACHIEVED BY VARIOUS TYPES OF ELEMENTS OF STRUCTURE

For up-to-date guidance on the fire resistance achieved by elements of structure, reference should be made to Schedule 8 of the Building Regulations 1965* and amendments as applicable. Some materials and methods of construction will also have test certificates giving performance when carried out in accordance with the appropriate test in B.S. 476.

APPENDIX 4

CLASSIFICATION OF VARIOUS TYPES OF WALL AND CEILING LINING MATERIALS

For up-to-date guidance on the surface spread of flame classification of lining materials, reference should be made to Fire Note No. 9 of the Ministry of Technology and Fire Officers Committee Joint Fire Research Organization (H.M.S.O. 1966—or later revision). Some materials will also have test certificates giving performance when carried out in accordance with the appropriate test in B.S. 476. Class 0 is defined in Regulation E14 of the Building Regulations 1965,* or subsequent amendment.

APPENDIX 5

DESIGNATION OF VARIOUS COMBINATIONS OF ROOF COVERING MATERIALS

For up-to-date guidance on the designation of various combinations of roof-covering materials, reference should be made to Schedule 10 of the Building Regulations 1965* and amendments as applicable. Reference should also be made to Fire Note No. 4 of the Joint Fire Research Organization. Some materials will also have test certificates giving performance when carried out in accordance with the appropriate test in B.S. 476.

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*Statutory Instrument 1965, No. 1373 (H.M.S.O.).

APPENDIX 6

→ see page 58

SHORT INDEX

This index is not intended to be exhaustive. The contents page at the front of this Bulletin refers the reader to the main subjects covered. Several points, however, are either not covered by separate entries in the contents page or are covered more than once in different connections. This short index draws these points together. The references are to paragraph numbers unless otherwise stated.

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APPENDIX 6

CONSTRUCTIONAL STANDARDS FOR PROJECTS STARTING AFTER 1 APRIL 1975

Administrative Memorandum 11/73
(Department of Education and Science)

Administrative Memorandum 7/73
(Welsh Education Office)
24 May 1973

Joint Administrative Memorandum from

DEPARTMENT OF EDUCATION AND SCIENCE AND
WELSH EDUCATION OFFICE

CONSTRUCTIONAL STANDARDS FOR MAINTAINED AND DIRECT GRANT EDUCATIONAL BUILDING IN ENGLAND AND WALES

1. Most new construction in England and Wales is subject to the Building Regulations 1972, which specify technical standards and enforcement procedures with the object of safeguarding public health and safety. Construction for Crown purposes, statutory undertakers and (with minor exceptions) maintained and direct grant schools and colleges* is exempt from the Building Regulations.

2. The Government recognises that there are advantages in bringing all construction within the scope of a single set of national building regulations. The existing arrangements for ensuring that maintained educational buildings are designed to standards adequate for the health and safety of occupants have worked well, and in practice the variation between the standards being applied in educational building and those of the Building Regulations 1972 is small and no major changes should result from bringing constructional standards closer together. It is not expected that the new arrangements will add significantly to the cost of building, but this will be kept carefully under review.

3. As a first step, local education authorities (except for the Inner London Education Authority which is subject to the London Building Acts and Schedule II of the London Government Act 1963) are requested to apply the standards stated in the Appendix to all projects starting on or after 1 April 1975. The Department will seek an assurance that these standards are being met, and for this purpose the appropriate forms in the ABB series are being amended to include a declaration on constructional standards which will be similar to the declaration on fire precautions currently required for major building projects. If an authority wishes to depart from the standards given in the Appendix they are requested to inform the Department (Architects and Building Branch).

4. Neither plans nor building in the course of construction will at any time be subject to inspection by authorities responsible for the enforcement of the Building Regulations 1972 (ie the district councils to be set up under local government reorganisation).

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*Maintained and direct grant educational buildings are exempt by virtue of Section 71 of the Public Health Act 1936 as amended by Section 63 of the Education Act 1944.

5. For the time being the standards will not have statutory force, so that there will be an opportunity to test their appropriateness for educational building. It is intended that after some years' experience and with any amendments that may prove to be necessary, the standards will provide the basis for enabling educational buildings to become subject to constructional requirements in the national Building Regulations.

6. The Standards for School Premises Regulations 1972 (SI 1972 No. 2051) will continue to apply.

To Local Education Authorities
Direct Grant Schools
Establishments of Further
Education and Colleges of Education

CONSTRUCTIONAL STANDARDS FOR EDUCATIONAL BUILDING

1. MATERIALS

The provisions of Part B of the Building Regulations 1972.

2. PREPARATION OF SITE AND RESISTANCE TO MOISTURE

The provisions of Part C of the Building Regulations 1972.

3. STRUCTURAL STABILITY

The provisions of Part D of the Building Regulations 1972.

4a. STRUCTURAL FIRE PRECAUTIONS

Chapter III of Building Bulletin 7 ("Fire and the Design of Schools") is withdrawn. In its place the provisions of Part E of the Building Regulations 1972 will apply, subject to the amendments listed below.

The recommendations in paragraphs 2, 3, 4 and 6 of Appendix 1 of Building Bulletin 7 are also drawn to authorities' attention, but since they are directed to the restriction of structural damage rather than personal safety they will remain discretionary.

List of amendments to be read in conjunction with Part E:

Regulation E5

In Table A Parts 1 and 2:

i. day special schools and all buildings for residential use by children under 5 shall be subject to the requirements set out for purpose group II;

ii. all other residential accommodation shall be subject to the requirements set out for purpose group III;

Table A shall not apply to other educational buildings and parts of educational buildings which shall instead be subject to the requirements set out in the following table.

No. of Storeys	Maximum Height (m)	Maximum Floor Area of a Storey or Compartment (m^2)	Maximum Cubic Capacity of Building or Compartment (m^3)	Minimum Fire Resistance in Ground Floor or Upper Storeys of Elements of Structure and Compartment Walls (notes 1 and 2) (hours)	Minimum Fire Resistance in Basement Storey of Elements of Structure and Compartment Walls (note 2) (hours)
1	No limit	800	4,000	Nil (note 3)	1 (note 4)
1	No limit	No limit	No limit	½	1
2–4	15	800	8,500	½	1
2–4	No limit	No limit	No limit	1	1½
5–7	28	No limit	14,000	1	1½
5 and over	No limit	No limit	No limit	1½	2

Note 1 : A roof beam in a structural frame is regarded as an element of structure.

Note 2 : Except Boiler Rooms, which in every case should be separated from all other parts of the building by construction having a fire resistance of at least 2 hours. Additionally where a boiler room is adjacent to a building more than 4 storeys high, the whole of its roof structure should have a fire resistance of at least 2 hours and be non-combustible.

Note 3 : Except

i. compartment walls and supports to a gallery which should have a minimum ½ hour resistance

ii. external walls (or their supports) requiring fire resistance because of their proximity to a boundary (see Regulation E7)

Note 4 : Nil, if the basement storey has a floor area not exceeding 50m² and is not a boiler room

Note 5 : Any internal oil storage must be in a completely separate compartment with a catch pit which is imperforate

Examples

To illustrate how this table should be used the following hypothetical buildings can be taken as examples:

1. A single storey building of height 3m and floor area 790m². Since the floor area and cubic capacity do not exceed the limits shown on the first line of the table there are no requirements for the fire resistance of the elements of structure.

   A single storey building of height 4·6m and floor area 1,000m². Since the floor area exceeds 800m² the designer has the choice of providing elements of structure of ½ hour minimum fire resistance or of dividing the area into 2 parts neither of which exceeds 800m² in area by a compartment wall having ½ hour minimum fire resistance.

3. A sports hall of height 6·9m and floor area 495m² (cubic capacity 3,415·5m²) would be within the limits specified in the first line of the table and no fire resistance is specified for the elements of structure.

4. A sports hall of the dimensions in 3 which is part of a larger single storey sports centre of cubic capacity 5,400m³ would need EITHER to have elements of structure with ½ hour minimum fire resistance OR to be in a compartment of less than 800m² in area and 4,000m³ in volume.

5. A three storey building 15m wide, 15m long and 9m high (thus, cubic capacity 2,025m³). The third line of the table applies, and elements of structure should thus have a minimum fire resistance of ½ hour.

6. A five storey building 21m long, 25m wide and 15m high (cubic capacity 7,875m³). The fifth line of the table applies, and elements of structure should thus have a minimum fire resistance of 1 hour.

Regulation E7

Table 1 of Schedule 9 Part 2 shall apply.

Regulation E14(4)

Substitute:

Any cavity in walls, partitions, floors or roofs which is continuous throughout the whole or part of such elements shall be fire stopped,

a. at any junction with another element or with a ceiling under a roof; and

b. i. if a surface of combustible material which is of class 2 or 3 is exposed within the cavity, at intervals such

that there is no continuous cavity (without a fire stop) which in one plane exceeds 8m in a single dimension;

ii. if a surface of class 0 in regulation E15 or class 1 is exposed within the cavity, at intervals such that there is no continuous cavity (without a fire stop) which in one plane exceeds 30m in a single dimension.

No surface of a cavity in an element of structure shall be of class 4, but nothing in this paragraph shall prohibit the insertion of combustible filling in a cavity.

4(b) MEANS OF ESCAPE FROM FIRE, ETC

Chapters I, II, IV and VI of Building Bulletin 7.

5. BALUSTRADES, PARAPETS AND RAILINGS ON BALCONIES AND EXTERNAL AREAS

Any balcony, platform, roof or other external area to which any person habitually has access from a building for any purpose other than maintenance or repair and which is above the uppermost level of the ground storey of the building shall have a balustrade, parapet or railing of such height, extent, construction and material as to afford reasonable safety for any person using such balcony, platform, roof or other external area.

6. CHIMNEYS AND FLUES

The provisions of Part L of the Building Regulations 1972.

7. HEAT-PRODUCING APPLIANCES AND INCINERATORS

The provisions of Part M of the Building Regulations 1972.

8. DRAINAGE

The provisions of Part N of the Building Regulations 1972.

9. SANITARY CONVENIENCIES

The provisions of Part P of the Building Regulations 1972.

(NOTE: Regulation P3(2) is not applicable to teaching spaces, but it should be remembered that the Food Hygiene (General) Regulations 1970 apply to rooms where food is consumed).

NOTES

1. The Department of the Environment is considering possible amendments to the Building Regulations. An amendment made to any of the above Parts should be regarded as having effect for the purposes of this Administrative Memorandum, unless notice is given to the contrary.

2. Parts F, G, H, J, K and Q of the Building Regulations 1972 will not apply.

3. If a relaxation of any of the above standards is to be sought, any third parties (such as occupiers of neighbouring property) who may be affected by the relaxation should be notified in writing of the proposed relaxation at the same time as the proposal is submitted to the Department of Education and Science.

DEPARTMENT OF EDUCATION AND SCIENCE

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