SUBSIDIARY LEGISLATION

STREET, DRAINAGE AND BUILDING ACT 1974 [ACT 133]
G.N. 5178/1984
UNIFORM BUILDING BY-LAWS 1984

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Preamble.

In exercise of the powers conferred by section 133 of the Street, Drainage and Building Act 1974 [*Act 133*], the Minister/State Authority makes the following by-laws:

PART I
PRELIMINARY

1. Citation.

These By-laws may be cited as the **Uniform Building By-laws 1984.**

2. Interpretation.

In these By-laws, unless the context otherwise requires--

"Act" means the Street, Drainage and Building Act 1974;

"advertisement hoarding" means any frame, hoarding, board, wall, bar, pillar, post, wire, or any combination of these, or any erection of any kind, or any surface or space used for the display of trade, business or professional advertisements;

"aggregate" means any material other than cement and water used in the making of concrete which does not contain additions or admixtures;

"alterations" include additions and extensions;

"approved" means approved by the local authority;

"approved plan" means a plan for a building approved by the local authority in accordance with these By-laws;

"architect" means any person who is registered as an architect under any law relating to the registration of architects an who under that law is allowed to practise or carry on business as an architect;

"ASHRE" means the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.;

"balcony" means any stage, platform, oriel window or other similar structure projecting outwards from the wall of a building and supported by brackets or cantilevered;

"base" in relation to a wall or pier means—

(a) the underside of the course immediately above the footings, if any, or in the case of wall carried by a beam, above the beam; and

(b) in any other case the bottom of such wall or pier;

"basement" means any storey or storeys of a building which is or are at a level lower than the ground storey;

"building line" means the line prescribed by either the competent plainning authority or the local authority beyond which no part of a building may project, except as otherwise permitted by these By-laws;

"BS" means the latest published edition of the British Standard Specification;

"BSCP" means the latest published edition of the British Standard Code of Practice;

"ceiling" means the covering to the underside of floor joist or ceiling joist or floor slabs excluding in all cases any supporting beams, and where no such covering exists means the underside of floor joists or roof cellars or ties excluding any supporting beams;

"column", in relation to structural steel, timber or reinforced concrete, means any part of construction which will by its resistance to compression in the direction of its length and to the bending actions induced by such compression, support and transmit loading;

"dead load" means that static weight of all walls, partitions, floors, roofs and finishes, including all other permanent construction;

"depth", in respect of a building, means the measured distance between the front line of the building and the back line of the rear main wall which separated the main building from the open space;

"detached building" means any building not attached to any other buildings;

"engineer" means a person who is registered as a professional engineer under any law relating to the registration of engineers and who under the low is allowed to practise or carry on the business of a professional engineer;

"external wall" means an outer wall of a building not being a party wall notwithstanding that it may immediately adjoin a wall of another building;

"factory" means any building or part thereof designed, adapted or used for—

(a) the making of any article or part of any article, commodity or product; or

(b) the altering, repairing, ornamenting, finishing, cleaning, washing or the breaking up or demolition of any article, commodity or product; or

(c) the adapting for sale or assembly of any article, commodity or product; and

(d) any other building as defined in the Factories and Machinery Act 1967;

"fire wall" means any wall, not being a party wall or external wall, of materials having the fire resistance as required under Part VII, of these By-laws and either used or constructed to be used for the separation of adjoining buildings or the separation of parts of a building in such manner as to prevent or reduce the spending of fire from one building to another or fro, part of a building to another part of that building and includes a proscenium wall, compartment wall, separating wall and a protecting structure;

"flat roof" means any roof having no inclination or having an inclination of not more than seven and one-half degrees with the horizontal;

"flood level" means such flood level as may be prescribed for any area by the local authority;

"floor" includes any horizontal platform forming the surface of any storey and any joist, board, timber, stone, concrete, steel or other substance connected with or forming part of such platform;

"footing" means the construction whereby the weight of the structure of building is transferred from the base structure to the foundations;

"foundation" means a system or arrangement of foundation units such as footing, raft of pile through which the loads from a building or structure are transferred to the supporting soil or rock;

"garage" for purpose of these By-laws, means a building or part thereof designed, adapted or used for the housing of motor vehicles;

"godown" means any building or part thereof designed, adapted ir used for storage purposes but does not include any garage ancillary to a residential building;

"grown storey" means the lowest storey of a building to which there is an entrance from the outside on or above the level of the ground at the front of the building;

habitable room" means any room not less than 6.5 square metres in area but does not include any bathroom, water-closet, open verandah, terrace or garage;

"hardwood timber" for the purpose of these By-;aws includes Cengan Batu, Balau, Resak, Tempenis, Jati, Cengan, Merbau, Kapur, Belian, Tembusu, Damar Laut Merah, Keruing, Teak or any similar natural durable heavy timber classified at such by the Forestry Department;

"headroom" means the clear vertical distance between the finished floor level and the soffit of the lowest projecting member or surface above that point;

"height" in relation to—

(a) a room means the vertical distance measured between the finished floor level and the underside of the ceiling excluding the thickness of the plaster;

(b) any storey means the vertical distance measured between the upper surfaces of its floor to the upper surface of the floor immediately above it;

(c) a wall means the vertical distance measured from the base of the wall to its highest part or, in the case of a gable, to half the height of the gable;

"hospital" means any building or part thereof designed, adapted or used for the care, accommodation or treatment of the sick, infirm, aged, convalescent or pregnant;

"hotel" means any building specifically designed and constructed or substantially adapted to be used to accommodate persons for the purpose of gain or profit, with or without arrangements for communal feeding, and includes a boarding house, lodging house or guest house;

"imposes load" means the load assumed to be produced by the intended occupancy or use including distributed, concentrated impact and inertia loads but excluding win loads;

"lateral support", in relation to a wall or pier, means such support in the direction of the thickness, length or breadth of the wall or pier which prevents movement thereof at the level and in line of the direction of such support;

"layout plan" means a plan approved by the competent planning authority;

"lintel" means a beam supporting walling over an opening or recess;

"load bearing", in relation to any part of a building its foundation, means the part of the building which bears a load other than that due its own weight and to wind pressure on its own surface;

"low lying land" means any land of which the surface is below flood level or which is so situated that it cannot at all times be efficiently drained by gravitation into an existing public surface water drain or water course;

"mesh" in relation to the measurement of materials, means the mesh of a sieve complying with BS 419--Test Sieves;

"mezzanine floor" means any floor interposed between the main floors of a building and includes any platform or landing of greater than 2.5. metres width;

"MS" means the latest published edition of the Malaysian Standard;

"MSCP" means the latest published edition of the Malaysian Standard Code of Practice;

"panel wall" means a non-load bearing wall set within a structural frame;

"partition" means any internal wall not being a party or an external wall;

"party wall" means a wall forming part of a building and used or constructed to be used for separation of adjoining buildings belonging to different owners or occupied or constructed or adapted to be occupied by different persons either constructed over or abutting a common boundary;

"pitched roof" means a roof having an inclination of more than seven and a-half degrees with the horizontal;

"prestressed concrete" means concrete in which predetermined stresses are induced to counteract the stresses due to dead and superimposed loading for the purpose of eliminating or decreasing the tensile stresses due to bending and sheer;

"qualified person" means any architect, registered building draughtsman or engineer;

"registered building draughtsman" for the purpose of these By-laws means any building draughtsman who is registered under the relevant Act;

"residential building" means a building of part thereof designed, adapted or used for human habitation;

"room" means any portion of a building enclosed by walls or partitions;

"school" means any portion of a building enclosed by walls or partitions;

"school" means any building or part thereof designed, adapted or used for the dissemination of knowledge and includes a creche;

"self-closing door" means a door fitted with a devise which is free from any means of holding it in an open position and which will close automatically unless held open by other approved means;

"semi-detached building" means any building part of which is designed, adapted or used for business purposes;

"smoke stop-door" means a door or pair of doors which when fitted in a frame satisfies the requirements of section 7 of BS 476: Part 8:1972 as to freedom from collapse for not less than thirty minutes and is resistant to the passage of flame and hot gases for not less than twenty minutes and which is fitted with minimum practical clearances between the leaf and frame;

"storey" means the space between the upper surface of every floor and the surface of the floor next above it, or if there be no such floor then the underside of the tie or collar beam of the roof or other covering or if there be neither tie nor collar beam then the level of half the vertical height of the underside of the rafters or other support of the roof;

"submitting person" means a qualified person who submits plans to the relevant authority for approval;

"swimming pool" means any pool or bath for the purpose of swimming;

"temporary building" includes any building constructed wholly or in part of materials which are, in the absence of special care, liable to rapid deterioration, or are otherwise unsuitable for use in the construction of permanent buildings, and may include any house or building the erection of which is permitted under licence issued by the local authority for a limited period to be specified upon the expiration of which the building shall be demolished;

"terrace house" means any residential building designed as a single dwelling unit and forming part of a row or terrace of not less than three such residential buildings;

"verandah-way" means a covered footway fronting a street;

"wind load" means all loads du to the effect of wind pressure or suction.

PART II
SUBMISSION OF PLANS FOR APPROVAL

3. Submission of plans for approval.

(1) All plans for buildings submitted to the local authority for approval in addition to the requirements of section 70 of the Act shall--

(a) be deposited at the office of the local authority together with the fees prescribed for the submission of such plans in accordance with the First Schedule to these B-laws;

(b) bear upon them a statement showing for what purpose the building for which the plans are submitted is to be erected and used;

(c) bear the certification of the qualified persons on these plans together with Form A as set out in the Second Schedule to these By-laws for which they are respectively responsible; and

(d) have attached thereto a stamped copy of the relevant site plan approved by the competent planning authority and certified within twelve calendar months preceding the date on which the building plans are deposited unless otherwise exempted under any law relating to planning.

(2) Every plan, drawing or calculation in respect of any building shall be submitted by a qualified person.

4. Return of plan.

(1) A local authority may if it is of the view that any plan, drawing or calculation is beyond the competence of such qualified person submitting the same, return such plan, drawing or calculation.

(2) A local authority shall accept any returned plan, drawing or calculation if the same were re-submitted together with a certificate from the relevant competent authority responsible for registering such qualified person, certifying that such plan, drawing or calculation is within the competence of such qualified person submitting the same.

5. Supervision of work.

Where under these By-laws any plan, drawing or calculation in relation to any building is required to be submitted by qualified person, no erection or continued erection of that building shall take place unless that qualified person or any person duly authorised by him undertakes the supervision of the erection and the setting out, where applicable, of that building.

6. Plans to be signed.

(1) All plans submitted shall be signed by qualified person and by the owner or his agent and shall bear the full address of the owner.

(2) The local authority may, is satisfied that the owner of the premises has refused to or has failed to execute any work which is required under the Act to be executed by him, direct the owner of the premises in writing to execute such work.

7. Withdrawal or change of qualified person.

(1) The qualified person submitting the plans shall be responsible for the proper execution of the works and shall continue to be so responsible until the completion of the works unless--

(*a*) with the agreement of the local authority another person is appointed to take over; or

(*b*) the local authority agrees to accept his withdrawal or replacement at the request of the owner provided that the erection of a building has not commenced.

(2) Where the local authority agrees to accept a qualified persons' withdrawal or replacement under paragraph (1) (*b*) of by-law 7 the works shall not commence until another qualified person is appointed to take over.

(3) Where any qualified person who has submitted any plan, drawing or calculation in respect of any building has died or become bankrupt or cannot be found or has been deregistered from the register or for any other person ceased to practise, the owner or occupier shall as soon as practicable appoint another qualified person to act for him and to submit adequate evidence to the local authority of the circumstances.

8. Plans to be deposited in triplicate.

(1) All building plans shall be deposited in-triplicate or in as many copies as may be required by the local authority.

(2) One set of the plans shall be on linen or other equally wear-resistant and durable material which, together with one other set, shall be retained by the local authority and the third set shall be returned after approval.

(3) If the plans are disapproved, one set of such plans shall be returned with a statement explaining the reasons for disapproval.

(4) Nothing in this by-law shall prohibit the depositing of additional sets of plans if it is considered that by so doing the work of the local authority may be expedited.

9. Scale of plans.

(1) All plans shall be drawn to the following scales:

(*a*) site plans	not less than 1 = 1000.
(*b*) key or location plans	any convenient scale.
(*c*) all other general building plans	not less than 1 = 100 except in special cases where the size of the building renders drawings to this scale to be impracticable to accommodate within the limitations of paper sizes or when the drawings are of unwiedly dimensions, the local authority may use its discretion to permit plans to be submitted to a smaller scale but in no case shall the scale but in no case shall the scale be less than 1 = 200.
(d) sketch plans for approval in principle	not less than 1 = 200.

(2) Notwithstanding paragraph (1), all plants may be drawn in International System of Units.

10. Plans required.

(1) All plants in respect of any building shall, unless inapplicable, contain the following:

(*a*) A site plan showing--

(i) the site of the proposed building lot together with the number of the lot and the section number;

(ii) the means of access to the site from the street and the name of the street;

(iii) the distance from the centre and side of roadway distinctly figured on one of such plans;

(iv) where required by the local authority the dimensions of the lot;

(v) the complete lines of surface water and foul water drainage and the point of discharge of the proposed drains;

(vi) the scale, North point and the numbers of adjoining lots or buildings;

(vii) the dimensions of clearances between the proposed building and the boundaries;

(viii) all lines of proposed adjustments of land or buildings for street, river or drainage improvements and such like where applicable showing the width of such new street or proposed new street and its connection with the nearest public street;

(ix) existing and proposed ground level of the site.

(*b*) A floor plan of each floor except when other floors are separate or are identical floors, containing the following information:

(i) figured dimensions of the lengths and breadths of the building and rooms and thickness of walls thereof;

(ii) figured dimensions of all door and window openings, the clear day-light area of air-wells, back areas and open spaces of the building;

(iii) figured dimensions between walls, piers and stanchions on the foundation plan of the building;

(iv) lines of permanent drainage of the site with arrows indicating the direction of flow, the drains into which they will discharge and their sizes;

(v) the names and uses of rooms.

(*c*) Cross, longitudinal and other sections to clearly delineate the construction of the building and showing—

(i) the existing ground level and proposed new ground level if the level of the site is to be raised or lowered;

(ii) the level of street, roadside drain and verandah-way (if the building abuts a street);

(iii) the width and depth of foundations and thickness of walls, partitions and floors thereof;

(iv) the height of storeys, staircases, doors, windows and ventilating openings thereof;

(v) the sizes, position and direction of floor joists and beans and the construction of the roof thereof; and

(vi) the materials to be used in the construction of the structure.

(*d*) Front, rear and side elevations showing—

(i) the levels of adjoining footways, verandah-ways, roads and the levels of the proposed counterparts;

(ii) part elevations of existing adjoining buildings showing their floor levels, main coping, parapets and verandah heights;

(iii) the materials proposed for the walls, windows and roof, if applicable and visible.

(2) The qualified person or owner or occupier as the case may be shall provide the local authority with such further information as the local authority may require.

(3) All plains shall either be in clear indelible prints or drawn in black with differences of material shown in distinct colours and all existing structures in neutral tints.

11. Exemption from by-law 10.

The local authority may if it deems fit exempt any person from any or all of the requirements of paragraph (1) of by-law 10.

12. Sketch plans for approval in principle.

(1) Notwithstanding the provisions of by-laws 8 and 10 when the consideration of the local authority is desired for approval in principle of a building, tentative sketch plans in duplicate on paper accompanied by a brief report sufficient to show the character and standard of the building may be submitted subject to the payment of the fees as prescribed in the First schedule to these By-laws.

(2) When a building has been approved in principle, plans in accordance with by-laws 3 to 10 and 14 to 16 shall be submitted and approved before erection of the building approved in principle may be commenced.

13. Special permission to commence building operations.

(1) The local authority may, in writing grant special permission to commence building operations provided that such commencement will not infringe the provisions of the Act or these By-laws.

(2) The granting of any permission under paragraph (1) of by-law 13 shall not deprive the local authority of its power t o give written directions in respect of such building.

14. Plans of alteration.

(1) In plans submitted for additions or alterations, including a subdivision of rooms, to a building, the parts, if any, of the building to be removed shall be shown in dotted lines and new work shall be either in red or in black fully coloured.

(2) All existing surface water and foul water drains, stairs, window and doors and all openings for light and ventilation of the building shall be shown on such plans.

15. Specifications.

If so required by the local authority plans submitted for approval shall be accompanied by a specification of all materials proposed to be used.

16. Details and calculation of structural plans.

(1) One copy of the detailed structural plans of the proposed building together with a legible copy of the structural calculations for the same shall be submitted before the commencement of construction.

(2) The detailed structure plans shall be on linen and each copy shall bear a certificate by the qualified person as in Form A as set out in the second schedule to these By-laws to the effect that the details are in accordance with there By-laws and that the submitting person accepts full responsibility.

(3) All structural plans shall be clearly marked to indicate the imposed loads for which each floor system or each part has been designed.

17. Power of local authority to reject structural plans and calculations.

Notwithstanding paragraph (2) by-law 16 of the local authority may examine and in so doing may reject any structural plans or calculations which are not in accordance with these By-laws and if it rejects such plans or calculations it may require such qualified person to resubmit new structural plans or calculations in respect of the rejected portion.

18. Permits.

(1) Sketch plans may be submitted for minor erections, minor alterations and additions in lieu of approved plans and permits may be issued as authority to carry out such works if they comply with the requirements of these By-laws, provided that if in the opinion of the local authority the works involved require the submission of normal building plans, such plans shall be submitted in accordance with these By-laws.

(2) Permits may be issued on such terms and conditions as the local authority thinks fit for the erection of any fence which encroaches on a footway.

19. Temporary permits.

(1) A temporary permit for a limited period may be issued by the local authority for the following purpose:

(*a*) the erection of a shed for shows or place of worship;

(*b*) the erection of a builders' working shed or a store or other shed to be used in connection with building works;

(*c*) the depositing of building materials on streets;

(*d*) the erection of scaffolding on a street;

(*e*) the erection of staging, framework, platform or superstructure of any kind on a roof abutting a street; and

(*f*) the erection of hoarding on streets in accordance with by-law 20.

(2) a temporary permit may be issued at the discretion of the local authority for the erection of a temporary building and shall be subject to all or some of the conditions as set out in the First Schedule to these By-laws.

(3) Plans or sketch plans in accordance with the requirement of the local authority shall be submitted for temporary permits under this by-law.

20. Advertisement hoardings.

(1) The erection of hoardings or any framing for the display of advertisement or sign-boards shall be subject to an annual temporary permit issued at the discretion of and subject to any conditions that may be imposed by the local authority.

(2) Plans or sketch plans of such hoardings or framings shall be submitted in accordance with the requirements of the local authority.

(3) The plans must be certified by the person submitting them to the effect that the proposed hoarding can be safely be supported by the structure onto which it is to be constructed and that he accepts full responsibility.

21. Materials not to be deposited in a street without permission.

(1) No person shall deposit any building materials in any street without a temporary permit issued under by-law 19.

(2) The fee for such permit shall be that prescribed in the First schedule to these By-laws.

(3) The person to whom such permit shall be that prescribed in the First schedule to these By-laws.

(4) Such materials shall be suitably lighted during the hours of darkness and a watchman shall be employed to ensure that this is done.

22. Notice of commencement of resumption of building operations.

(1) Notice of the intention to commence or resume the erection of a building required under subsection (9) of section 70 of the Act shall be made in Form B as set out in the Second Schedule to these By-laws and shall include particulars of the intended work.

(2) If the work is not commenced or resumed on the date given in such notice, a further notice in Form B as set out in the Second Schedule to these By-laws shall be given before the work may be commenced or resumed.

23. Notice of completion of setting out.

(1) As soon as the setting out of building has been completed, the qualified person shall give written notice to the local authority in Form C as set out in the Second Schedule to these By-laws certifying either that the setting out has been carried out in accordance with the approved site plan or, if there has been any deviation from the approved site plan, that he will undertake to submit the required number of amended site plans for approval before the completion of the building.

(2) In either event the qualified person shall certify that he accepts full responsibility for ensuring that all town planning and building requirements are complied with.

24. Notice of completion of excavation for foundation.

As soon as the excavation for the foundation of a building has been completed the qualified person shall give written notice to the local authority in Form S as set out in the Second Schedule to these

By-laws informing it of the fact and certifying that the nature of the soil conditions as exposed by the excavations are consistent with the design requirements and conform with these By-laws.

25. Certificate of fitness for occupation.

(1) Certificate of fitness for occupation of a building shall be given when--

(*a*) the qualified persons during the course of the work have certified in Form E as set out in the Second Schedule to these By-laws that they have supervised the erection of the building, that to the best of their knowledge and belief the building has been constructed in accordance with these By-laws and any conditions imposed by the local authority and that they accept full responsibility for those portions which they are respectively concerned with and the local authority or an officer authorised by it in writing for the purpose has inspected the building.

(*b*) all essential services, including access roads, landscape, car parks, drains, sanitary, water and electricity installation, fire lifts, fire hydrant and other where required, sewerage and refuse disposal requirements have been provided.

(2) Nothing contained in this by-law shall prevent the local authority or any officer authorised by it in writing for the purpose from inspecting any building works at any stage thereof and calling attention to any deviation from the approved plan or non-compliance with any of these By-laws which he may observe and from giving notice in writing ordering such deviation to be rectified.

26. Temporary certificate of fitness for occupation.

(1) Subject to payment of the fees prescribed in the First Schedule to these By-laws, the local authority may after imposing a deposit either in cash or bank guarantee at the fixed rates in its discretion grant a temporary certificate of fitness for occupation of a building for a period, not exceeding six (6) months in cases where only minor deviation from the approved building plans had been made and pending full compliance with the requirements of the local authority before the issue of the certificate of fitness for occupation.

(2) Where the certificate under paragraph (1) is issued and the owner of the occupier of the building does not fully comply with the requirements as imposed, the local authority may make use of the deposit for the purpose of complying with the said requirements.

27. Partial certificate of fitness for occupation.

(1) The local authority may in its discretion grant a partial certificate of fitness for the occupation of any part of a building partially completed and may impose any conditions that it deems necessary in the public interest:

Provided that no such permit shall be granted if—

(*a*) no application for partial certificate of fitness for occupation has been made within the period of construction;

(*b*) all essential services, including access road, landscape, car parks, drains, sanitary, water and electricity installations, fire lifts, are hydrant and others where required, sewerage and refuse disposal requirements have not been provided; and

(*c*) the occupation of such part or parts of a partially completed building will prejudice public health or safety.

(2) A partial certificate of fitness for occupation once issued shall remain effective until the whole of the building is completed and a certificate of fitness for occupation is issued.

28. Offence under the Act.

No person shall occupy or permit to be occupied any building or any part thereof unless a certificate of fitness for occupation, a partial certificate of fitness for occupation or a temporary certificate of fitness for occupation has been issued under these By-laws for such building and any failure to comply with this by-law shall render such person liable to prosecution under the Act.

29. Fees for consideration of plans and for permits.

Fees in accordance with the First schedule to these By-laws shall be paid by persons who submit plans and specification for approval in respect of buildings to be constructed or altered or for the issue of permits or temporary permits in accordance with these By-laws.

PART III
SPACE, LIGHT AND VENTILATION

30. Open spaces to be provided.

Every building which is erected shall, unless the local authority is of the opinion that in any particular case air space is otherwise sufficiently and permanently provided for, have directly attached thereto as open space exclusively belonging thereto if such dimensions as may be prescribed hereafter.

31. Open spaces not to be altered or roofed.

(1) Whenever any open space has been provided in connection with any building in pursuance of these By-laws, no person shall, without the approval in writing of the local authority--

(*a*) make or maintain or permit to be made or maintained any alteration in such open space; or

(*b*) construct or maintain or permit to be constructed or maintained a rood over any portion thereof so as to diminish the area of such open space:

Provided that the local authority in its discretion may issue such a permit if it is satisfied that the free movement of air is not impeded or hindered.

(2) The local authority may by notice in writing require the owner or any person acting in contravention of this Part to remove any such alteration or roof or otherwise to do such works as will restore such open space.

32. Space about buildings abutting a street and a back-lane.

(1) The open space for buildings abutting a street and back-lane shall be--

(*a*) in respect of residential buildings, not less than one-third of the built-on area of the building lot; and

(*b*) in respect of other buildings used for non-residential purposes, not less than one-tenth of the built-on area of the building lot.

(2) For the purpose of calculating the open space required by paragraph (1) of by-law 32--

(*a*) in a two-storeyed shophouse the space occupied by any single-storeyed annexe not being a habitable room which does not exceed the height of the ceiling of the ground floor shall be considered as neutral and shall not be counted as open space;

(*b*) half the width of the back-lane abutting a building shall be counted as open space;

(*c*) balconies, passage-ways and sun-shades may project over any open space provided they do not project more than 1 metre and such projection shall be counted as open space and not as built up area;

(*d*) the open space provided between the street and the set back for a building line of a terrace house shall not be counted as open space.

(3) Where open space not abutting a back-lane is provided for, such open space shall have a minimum clear dimension of not less than 2.5 metres and such open space shall exclude projections of hoods, sun-shades or balconies.

33. Space about buildings on lots abutting a street and having no back-lane.

For a building on a lot abutting a street and having no back-lane, the open space shall be situated at the rear of the building and shall extend across the full width of the lot.

34. Space about detached buildings.

(1) Subject to the specific requirement of Part VII, for a detached building there shall be not less than 2 metres clear space measured between the extreme projections of the building and boundaries of its lot and 4 metres clear space between such building and any other building unless they are within the same building lot.

(2) For the purpose of this by-law a pair of semi-detached buildings shall be deemed to be one building on a single lot.

35. Access from a street.

Every building to be erected on a site which does not front a street shall have access from a street and the means, nature and extent of the access shall be on accordance with a layout plan approved by the competent planning authority or the local authority.

36. Splayed corner.

Where a building is erected at the junction of two streets and in access where the degree of splay or rounding off is not shown on the layout plan or any statutory amendment, modification or replacement thereof maintained by the competent planning authority, the corner of such building shall be splayed

or rounded off to a height of not less than 5 metres above the street level at the point of intersection of the street lines so that both part of the building below this height shall project beyond the straight line drawn across the corner of the building plot joining each street line at a point 3 metres from the point of intersection of the street lines.

37. Projections over the street and over the building line.

(1) Where buildings abut on a street, projection over the street for open, verandahs, balconies, sun-shades or similar projections may be permitted on the following basis:

$$\text{Projection} = \frac{\text{Width of street in metres minus 10 metres}}{2}$$

Provided that the maximum projection which may be permitted under this formula is 1.25 metres clear of the approved line of street.

(2) Projections in the nature of canopies over entrances in excess of 1.25 metres may be permitted at the discretion of the local authority.

(3) All such projections shall be at least 5 metres above the level of the road. Between the levels of 2.5 metres and 5 metres, projections not exceeding 500 millimetres may be permitted.

(4) Where a building line is prescribed for a street set back from the regular line of street, projections above the ground floor over such building line may be permitted provided that such projection shall not exceed 1. 83 metres and shall not exceed one half of the building frontage to the building line.

38. Width of footway.

(1) The width of any verandah-way or uncovered footway shall not be less than 2.25 metres but piers or columns to a maximum depth of 600 millimetres from the boundary of the street may be permitted on such verandah-way or footway.

(2) The width of the verandah-way or uncovered footway shall be measured from the boundary of the street to the wall or other part (not being an outside verandah pier) of the building nearest the street, and all dimensions referred to in this by-law shall be measured at the pavement level of the verandah or uncovered footway.

(3) For the purpose of this by-law any step, threshold or other structure appurtenant to a building shall be deemed to be part of the building though no directly connected therewith.

(4) Where there is a change in levels along the footway between adjoining lots there shall be provided steps with risers not exceeding 150 millimetres and treads not less than 275 millimetres or a pedestrian ramp of gradient not exceeding one in ten.

(5) Where a service road is provided the footway required to be provided and constructed shall follow the line of the street.

39. Natural lighting and ventilation.

(1) Every room designed, adapted or used for residential, business or other purposes except hospitals and schools shall be provided with natural lighting and natural ventilation by means of one or more windows having a total area of not less than 10% of the clear floor area of such room and shall have openings capable of allowing a free uninterrupted passage of air of not less than 5% of such floor area.

(2) Every room used for the accommodation of patients in a hospital shall be provided with natural lighting and natural ventilation by means of one or more windows having a total area of not less than 15 of clear floor area of such room and shall have openings capable of allowing a free uninterrupted passage of air or not less than 10% of such floor area.

(3) Every room used for the purpose of conducting classes in a school shall be provided with natural lighting and natural ventilation by means of one or more windows having a total area of not less than 20% of clear floor area of such rooms and shall have openings capable of allowing a free uninterrupted passage of air of not less than 10% of such floor area.

(4) Every water-closet, latrine, urinal or bathroom shall be provided with natural lighting and natural ventilation by means of one or more openings having a total area of not less than 0.2 square metre per water-closet, urinal latrine or bathroom and such openings shall be capable of allowing a free uninterrupted passage of air.

40. Air-wells.

(1) (*a*) The minimum size of each air-well where provided in all buildings shall be as follows:

(i) for buildings up to 2 storeys in height, 7 square metres;

(ii) for buildings up to 4 storeys in height, 9 square metres;

(iii) for buildings up to 6 storeys in height, 11 square metres;

(iv) for buildings up to 8 storeys in height, 13 square metres;

(v) for buildings more than 8 storeys in height, 15 square metres;

(*b*) The minimum width of such air-wells in any direction shall be 2.5 metres.

(2) (*a*) The minimum size of each air-well for lavatories, water-closet and bathrooms shall be as follows:

(i) for buildings up to storeys in height, 3.5 square metres;

(ii) for buildings up to 4 storeys in height, square metres;

(iii) for buildings up to 6 storeys in height, 4.5 square metres;

(iv) for buildings up to 8 storeys in height, 5 square metres;

(v) for buildings more than 8 storeys in height, 5.5 square metres;

(*b*) The minimum width of such air-wells in any direction shall be 2 metres.

41. Mechanical ventilation and air-conditioning.

(1) Where permanent mechanical ventilation or air-conditioning is intended, the relevant building by-laws relating to natural ventilation, natural lighting and heights of rooms may be waived at the discretion of the local authority.

(2) Any application for the waiver of the relevant by-laws shall only be considered if in addition to the permanent air-conditioning system there is provided alternative approved means of ventilating the air-conditioned enclosure, such that within half an hour of the air-conditioning system failing, not less than the stipulated volume of fresh air specified hereinafter shall be introduced into the enclosure during the period when the air-conditioning system is not functioning.

(3) The provisions of Third Schedule to these By-laws shall apply to buildings which are mechanically ventilated or air-conditioned.

(4) Where permanent mechanical ventilation in respect of lavatories, water-closets, bathrooms or corridors is provided for and maintained in accordance with the requirements of the Third Schedule to these By-laws, the provisions of these By-laws relating to natural ventilation and natural lighting shall not apply to such lavatory, water-closets, bathrooms or corridors.

42. Minimum areas of rooms in residential buildings.

(1) The area of the first habitable room in a residential building shall be not less than 11 square metres, the second habitable room be not less than 9.3 square metres and all other rooms be not less than 6.5 square metres in area.

(2) The width of every habitable room in a residential building shall be not less than 2 metres.

(3) The area and width of a kitchen in a residential building shall be not less than 4.5 square metres and 1.5 metres respectively.

43. Minimum dimensions of latrine, water-closet and bathrooms.

In all buildings, the sizes of latrine, water-closets and bathrooms shall be--

(*a*) in the case of latrines or water-closets with pedestal-type closet fittings, not less than 1.5 metres by 0.75 metre;

(*b*) in the case of water-closets with fittings other than pedestal-type closet fittings, not less than 1.25 metres by 0.75 metre;

(*c*) in the case of bathrooms, not less than 1.5 square metres with a width of not less than 0.75 metre; and

(*d*) in the case of bathrooms with closet fittings, not less than 2 square metres with a width of not less than 0.75 metre.

44. Height if rooms in residential buildings, shophouses, schools, etc.

(1) The height of rooms in residential buildings other than shophouses shall be--

(*a*) for living rooms and bedrooms, not less than 2.5 metres;

(*b*) for kitchens, not less than 2.25 metres;

(*c*) for bathrooms, water-closets, latrines, porches, balconies, verandahs, garages and like, not less than 2 metres.

(2) The average height of rooms with sloping ceilings in residential buildings other than shophouses shall be--

(*a*) for living rooms and bedrooms, not less than 2.5 metres;

(*b*) for kitchens, not less than 2.25 metres;

(*c*) for bathrooms, water-closets, latrines, porches, balconies, verandahs, garages and the like, not less than 2 metres.

Provided that not part of any room shall be less than 2 metres in height.

(3) In shophouses the height of ground floor rooms shall be not less than 3 metres and the height of upper floor rooms shall be not less than 2.5 metres. Where the depth of such shophouse at any upper floor level is greater than 10.5 metres the height of rooms on every such upper floor shall be not less than 2.55 metres.

(4) In schools, the height of rooms used for the dissemination of knowledge shall be not less than 3 metres headroom.

(5) In hospitals the height of rooms used for the accommodation of patients shall be not less than 3 metres.

(6) The height of any room in a factory in which any person works shall be not less than 3 metres headroom.

45. Height of rooms in places of public resorts.

(1) The height of rooms, other than water-closets, lavatories, cloakrooms, corridors and rooms to which the public do not have access in places of public resort shall be not less than 3.5 metres. Where a balcony is provided for in places of public resort, the heights between the level of the topmost tier of the balcony and the ceiling over such topmost tier, and between the floor immediately under the balcony and the underside of the balcony, shall be not less than 3 metres in each case.

(2) In places of public resort the provisions of paragraphs (1) of by-law 46 shall apply to water-closets, lavatories, cloakrooms, corridors and rooms to which the public do not have access.

46. Height if rooms in other buildings.

(1) In building other than those specified in the preceding provisions of by-laws 44 and 45 the height of rooms on the ground floor shall not be less than 3 metres and on any floor above the ground floor shall not be less than 2.75 metres.

(2) The height of any basement shall be not less than 2.5 metres.

(3) Where the greater part of the ground floors is left open for use as car-park or covered garden or similar purpose, the height of such ground floor shall be not less than 2.5 metres.

(4) The minimum headroom of any habitable room or space inside any building shall be 2 metres.

(5) The height of any verandah-way shall be not less than 3 metres.

47. Projections over a verandah-way.

Projections in nature of--

(*a*) beams;

(*b*) stairways and landings;

(*c*) screens;

(*d*) blinds; and

(*e*) signboards or advertisement;

which are not less than 2.5 metres above the verandah-way paving may be permitted.

PART IV
TEMPORARY WORKS IN CONNECTION WITH BUILDING OPERATIONS

48. Commencement of building operation.

(1) When any building operation is commenced, the person responsible for the erection shall display a board giving the names, addresses and telephone numbers of the submitting person and building contractor.

(2) Construction of any building shall not commence unless a protective hoarding to the requirements of the local authority is erected to separate the building from the public street or footway.

(3) Where a protective hoarding is required, a temporary permit shall be obtained in accordance with by-law 19 and the protective hoarding shall be constructed according to the approved protective hoarding plan and shall during the demolition or erection of any building be maintained in good condition to the satisfaction of the local authority.

49. Responsibility of person granted temporary permits.

The person to whom the temporary permit is granted shall be responsible for--

(*a*) taking such measures as are necessary to keep the roadside drain clear of obstruction and to the satisfaction of the local authority;

(*b*) adjustments to existing cables, pipes and other service or utility or equipment and for their reinstatement on completion of the works in accordance with the requirements of the relevant authorities;

(*c*) painting the ends of the hoardings white and for having the ends of hoardings and railings suitably marked by red warning lights throughout the night;

(*d*) any accident and damage to property or persons, directly attributable to the hoardings or railings;

(*e*) ensuring that hydrant points and any other existing utility service installations are not obstructed by such hoardings or materials;

(f) providing suitable openings with hand-rails at the ends of the hoarding to permit easy means of access and egress over the roadside drain, to and from the adjoining verandah-ways;

(*g*) the maintenance of the hoarding to the satisfaction of the local authority;

(*h*) exercising due care not to damage any existing service mains by overloading the ground or by any temporary construction;

(*i*) removing the hoarding together with all materials and debris on completion of the works; and

(*j*) to reinstate any damage to roads, drains, footways and verandah-ways and leaving the site and drains in a clean any tidy condition.

50. Cancellation of temporary permit.

The local authority shall have the right to cancel the temporary permit for breach of any of the foregoing conditions or for any reason it thinks fit and the applicant shall within one week of receipt of such notice have the hoardings, railings and all other materials connected therewith removed from the public road.

51. Vehicular access to site.

Vehicular access to the site may be restricted to specified hours to avoid obstructing the flow of traffic if found to be necessary.

52. Rising mains to be installed progressively.

In buildings which are designed to exceed 18.3 metres in height to the top most full floor, rising mains in accordance with by-law 232 shall be installed as soon as the building exceeds that height to provide fire fighting facilities during the various stages of construction.

PART V
STRUCTURAL REQUIREMENTS

53. Building materials.

(1) Any materials used-

(*a*) in the erection of a building;

(*b*) in the structural alteration or extension of a building;

(*c*) in the execution of works or the installation of fittings, being works or fittings to which any provision of these By-laws applies; or

(*d*) for the backfilling of any excavations on a site in connection with any building or works or fittings to which any provision of these By-laws applies, shall be -

(*aa*) of a suitable nature and quality in relation to the purposes for and conditions in which they are used;

(*bb*) adequately mixed or prepared; and

(*cc*) applied, used or fixed so as to adequately perform the functions for which they are designed.

(2) The use of any material or any method of mixing or preparing materials or of applying, using or fixing materials, which conforms with a Standard Specification or Code of Practice prescribing the quality of material or standards of workmanship shall be deemed to be sufficient compliance with the requirements of paragraph (1) of by-law 53 if the use of the material or method is appropriate for the purpose and conditions in which it used.

54. General requirements of loading.

(1) In determining, for the purposes of these By-laws, the loads to which any building will be subjected, the dead and imposed loads and wind loads shall be calculated in accordance with this Part:

Provided that in the case where –

(*a*) an actual imposed load to which a building will be subjected will exceed the imposed load calculated in accordance with
this Part, such actual load shall be substituted for the load so calculated; and

(*b*) plant, machinery or equipment will produce exceptional dynamic effects, there shall be substituted for the imposed load
calculated in accordance with this Part such greater amount which would, as a static load, produce stresses of a magnitude
and kind approximating to that induced dynamically.

(2) In determining, for the purposes of this Part, the loads to which a building will be subjected-

(*a*) dead loads shall be calculated in accordance with BSCP 3 Chap. V Part 1 or as provided hereinafter in this Part:

(*b*) imposed loads shall be calculated in accordance with BSCP 3 Chap. V Part 1 or as provided hereinafter in this Part:

Provided that, if any actual imposed load will exceed or is likely to exceed the load so calculated that actual load shall be
substituted for the load so calculated; and

(*c*) wind loads shall be calculated in accordance with BSCP 3 Chap. V Part 2 :
Provided that –

(*aa*) in no case shall the factor S 3 be taken as less than 1; and

(*bb*) if a building falls outside the range of those for which that code gives them forces and pressure coefficients values shall be used which are appropriate in relation to that building; having regard to its construction, size, proportions, shape, profile and surface characteristics.

(3) Advice on appropriate wind velocities applicable to a particular locality to which the building is to be located shall, whenever possible be obtained from the local meteorological office.

55. Dead and imposed loads.

(1) The provisions of this Part relating to dead and imposed loads shall apply to -

(*a*) new buildings and new structures;

(*b*) structural alterations and additions to existing buildings and existing structures; and

(*c*) existing construction on change of use;

but shall not apply to the maintenance of, or the replacement of parts of, existing buildings and structures where there is no change of use.

(2) The dead and imposed loads provided hereinafter shall be in addition to and not in substitution of provision relating to –

(*a*) loads on road bridges;

(*b*) loads on rail bridges;

(*c*) loads due to wind;

(*d*) loads due to seismic forces;

(*e*) loads due to explosions;

(*f*) loads on structures subject to internal pressure from their contents such as bunkers, silos and water tanks;

(*g*) loads incidental to construction;

(*h*) loads due to lifts and escalators;

(*i*) loads due to machinery vibration (except those due to some gantry cranes);

(*j*) loads due to thermal effects; and

(*k*) test loads.

56. Dead loads calculated from weights of materials used.

(1) Dead loads shall be calculated from unit weight given in BS 648 or from the actual known weights of the materials used.

(2) Typical values for commonly used materials are laid out in the Fourth Schedule to these By-laws.

57. Weight of partitions.

Where partitions are shown in the plans, their actual weights shall be included in the dead load. To provide for partitions where their positions are not shown on the plans, the beams and the floor slabs where these are capable of effective lateral distributions of the load, shall be designed to carry, in addition to other loads, a uniformly distributed load per square metre of not less than one third of the weight per metre run of the finished partitions, but not less than 1kN/m? (102kgf/m?) if the floor is used for office purposes.

58. Contents of tanks and other receptacles.

The weight of tanks and other receptacles, and of their contents shall be treated as dead loads; account shall be taken of the load conditions when a tank or receptacle is full and when it is empty.

59. Imposed floor loads.

(1) The loads appropriate to the different uses to which the parts of a building or structure may be put are as specified in the Fourth Schedule to these By-laws.

(2) The distributed loads specified therein are equivalent to uniformly distributed static loads per square metres of plan area and provide for the normal effects of impact and acceleration, but not for any special concentrated loads.

(3) All floor slabs shall be designed to carry the appropriate distributed or concentrated imposed load whichever produces the greater stresses in the part of the floor slab under consideration.

(4) In the design of floor slabs, concentrated loads shall be considered to be applied in the positions which produce the maximum stresses and, where deflection is the design criterion, in the positions which produce maximum deflections.

(5) The concentrated imposed load need not be considered where the floor slabs are capable of effective lateral distribution of this load.

(6) All beams shall be designed to carry the distributed load appropriate to the uses to which they are put.

(7) Beams, ribs and joists spaced at not more than one metre centres may be designed as floor slabs.

(8) Where in the Fourth Schedule to these By-laws no values are given for concentrated load, it may be assumed that the tabulated distributed load is adequate for design purposes.

60. Mechanical stacking.

Where there is the possibility of the use of mechanical stacking machines, such as fork lift trucks, special provision shall be made in the design of the floors.

61. Imposed loads on ceilings, skylights and similar structures.

(1) The support of ceilings (other than false ceilings), ribs of skylights, frames and covering (other than glazing) if access hatches and similar structures shall be designed for the following loads:

(*a*) 0.25kN/m2 (25.5kgf/m2) distributed uniformly over the whole area of area supported; and

(*b*) 0.9kN (91.8kgf) concentrated over a length of 125 millimetres or, in the case of coverings, over a square of 125millimetres side so places as to produce maximum stresses in the affected members.

(2) Where any member will in no circumstances need to support the weight of a man, the concentrated load provided in paragraph (1)(b) above may be neglected. Then concentrated load should be considered to act at the same time as the distributed load and may be treated as a short term load.

(3) For the purpose of this by-law false ceiling means a ceiling which is built with a space between it and the structure above and which satisfies at least one of the following conditions relating to access to that space:

(*a*) the space is inaccessible; or

(*b*) the ceiling is demountable for access; or

(*c*) the space is provided with catwalks supported independently.

62. Reductions in total imposed floor loads.

(1) Except as provided for in paragraphs (2) and (3), the reduction in assumed total imposed floor loads given in the Table 1 below may be taken in designing columns, piers, walls, their supports and foundations.

TABLE 1: REDUCTION IN TOTAL DISTRIBUTED IMPOSED FLOOR LOADS

Number of floors, including the roof, carried by member under consideration	Reduction in total distributed imposed load on all floors carried by the member under consideration %
1	0
2	10
3	20
4	30
5 to 10	40
over 10	50

(2) For the purposes of this by-law, a roof may be regarded as a floor. For factories and workshops design for imposed load of 5kN/m2 (510kgf/m2) or more, the reductions shown in the Table 1 may be taken provided that the loading assumed is not less than it would have been if all floors had been designed for 5k/N/m2 (510kgf/m2) with no reductions.

(3) Where a single span of a beam or girder supports not less than 46 square metres of floor at one general level, the imposed load may in the design of the beam or girder be reduces by 5% or each 46 square metres supported. subject to a maximum reduction of 25%. This reduction, or that given in the Table 1, whichever is greater, may be taken into account in the design of columns of other types of members supporting such a beam.

(4) No reduction shall be made for only plant or machinery which is specifically allowed for or for buildings for storage purposes, warehouse, garage, and those office area which are used for storage and filling purposes.

63. Imposed roof loads.

(1) For the purpose of this by-law all slopes are measured from the horizontal, all loads are applied vertically and the 125 millimetres and 300 millimetres squares are measured on the roof slope.

(2) On flat roofs and sloping roofs up to and including 10 degrees, where access (in addition to that necessary for cleaning and repair) is provided to the roof, allowance shall be made for an imposed load of 1.5kN/m2 (153kgf/m2) measured on plan, or a load of 1.8kN (184kgf) concentrated on a square with a 300 millimetres side, measured in the plane of the roof, whichever produces the greater stresses in the part of the roof under considerations.

(3) On flat roofs and sloping roofs up to and including 10 degrees where no access is provided to the roof except for maintenance, allowance shall be made for an imposed load of 0.25kN/m2 (25.5kgf/m2) measured in the plane of the roof, or a vertical load of 0.9kN (91.8kgf) concentrated on a square with 1225 millimetres side, measured in the plane of the roof, whichever produces the greater stresses in the part of the roof under consideration.

(4)On surfaces where accumulation of rain water is possible the loads due to such accumulation of water and the imposed loads for the roofs as given above shall be considered separately and the more critical of the two shall be adopted in the design.

(5) On roofs with a slope greater than 10degrees, and with no access provided to the roof (other than that necessary for cleaning and repair), the following imposed loads shall be provided:

(*a*) for a roof-slope of 30degrees or less 0.25kN/m2 (25.5kgf/m2) measured on plane or a vertical load of 0.9kN (91.8kgf) concentrated on a square with a 300 millimetres side, whichever produces the greater stress.

(*b*) for a roof slope of 75degrees or more no allowance is necessary.

For roof slopes between 30degrees and 75degrees, the imposed load to be allowed for may be obtained by linear interpolation between 0.25kN/m2 (25.5kgf/m2) for a 30 degrees roof slope and nil for a 75 degrees roof slope.

64. Curved roofs.

The imposed load on a curved roof shall be calculated by dividing the roof into not less than five equal segments and by then calculating the load of each, appropriate to its mean slope, in accordance with paragraphs (2) and (3) of by-law 63.

65. Roof coverings.

To provide for loads incidental to maintenance, all roof coverings, other than glazing, at a slope less than 45 degrees shall be capable of carrying a load of 0.9kN (91.8kgf) concentrated on any square with a 125 millimetres side, measured in the plane of the roof.

66. Internal suspended load on primary structural members.

Due allowance shall be made in the design of roof trusses or other primary structural members supporting roofs, for the weight of heating, lighting and ventilating equipment, service trunking, piping

for liquids or gases, mechanical handling or production equipment and overhead walkways for inspection and maintenance, as applicable.

67. Amount of suspended load.

Any panel point of the lower chord of such roof trusses or any point of such other primary structural members supporting roofs over garages, manufacturing or storage floors shall be capable of carrying safely a suspended concentrated load of not less than 9.0kN (918kgf) in addition to the imposed load on the roof.

68. Dynamic loading.

(1) Where loads arising from machinery, runways, cranes and other plant producing dynamic effects are supported by or communicated to the framework, allowance shall be made for these dynamic effects, including impact, by increasing the dead weight values by an adequate amount.

(2) In order to ensure due economy in design, the appropriate dynamic increase for all members affected shall be ascertained as accurately as possible

(3) In the absence of sufficient data for such calculation, the increase in the imposed loads shall be as follows:

Structure	Increase in imposed load (per cent)
For frames supporting lifts and hoists	100
For foundation, footways and piers supporting lifts and hoistering apparatus	40
For light machinery, shaft or motor units	not less than 20
For reciprocating light machinery or power units	not less than 20

(4) Concentrated imposed loads including impact and vibrating effects which may arise due to installed machinery shall be considered and provided for in the design. In any event the increase in imposed loads shall not be less than 20%.

(5) Provisions shall also be made for carrying any concentrated equipment loads while the equipment is being installed or moved for servicing and repairing.

69. Crane gantry girders.

(1) In respect of crane gantry girders, the following allowances shall be deemed to cover all forces set up by vibration shock from slipping of slings, kinetic action of acceleration and retardation and impact of wheel loads:

(*a*) for loads acting vertically, the maximum static wheel loads shall be increased by 25% for an electric overhead crane and 10% for a hand-operated crane;

(*b*) the horizontal force acting transverse to the rails shall be taken as the following percentage of the combined weight of the cab and the load lifted:

(i) 10% for an electric overhead crane; and

(ii) 5% for a hand-operated crane.

The horizontal force shall be taken into account when considering the lateral rigidity of the rails and their fastenings;

(*c*) horizontal forces acting along the rails shall be taken at the following percentages of the static wheel loads which can occur on the rails:

(i) 10% for an electric overhead crane; and

(ii) 5% for a hand-operated crane.

(2) The forces specified in paragraph (1) above shall be considered as acting at the rail level and being appropriately transmitted to the supporting system.

(3) Gantry girders and their vertical supports shall be designed on the assumption that either of the horizontal forces specified in paragraph 1 may act at the same time as the vertical load.

(4) The provisions of paragraphs (1), (2) and (3) shall apply only to a single crane operation and to simple forms of crane gantry construction and separate provisions shall be provided for in the calculation in respect of heavy cranes, high-speed operation or multiple crane on a single gantry.

70. Parapets and balustrades.

Parapets and balustrades shall be designed for the minimum loads as provided in Table 2 below. The minimum loads are expressed as horizontal forces acting at handrail or coping level.

TABLE 2. HORIZONTAL LOADS ON PARAPETS AND BALUSTRADES

Use	Intensity of horizontal load	
	N/m run	*kgf/m run*
Light access stairs, gangways and the like not more than 600mm wide	220	22.4
Light access stairs, gangways and the like not more than 600mm wide, stairways, landings and balconies, private and domestic	360	36.7
All other stairways, landings and balconies and all parapets and handrails to roof	740	75.5
Panic barriers	3000	306.0

71. Vehicle barriers for car-parks.

(1) Where a barrier to withstand the force of a vehicle is required for a car-park it shall be designed to withstand a force F uniformly distributed over any length of 1.5 metres where---

$$F = \frac{½\ MV^2\ kN\ (1000\ (½\ mv^2))\ kgf}{\delta_c + \delta_b\ (\ 9.8\ (\delta_c + \delta_b\ )}$$

m = mass of vehicle in kg

v = velocity in m/s

δ_c = deflexion of the vehicle in mm

δ_b = deflexion of the barrier in mm

(2) Where the car park has been designed on the basis that vehicles using it will not exceed 2500 kilograms the following values shall be used to determine the force F:

m = 1500 kg*

v = 4.47 m/s

δ_c = 100 mm unless better evidence is available.

For a rigid barrier the force appropriate to vehicles up to 2500 kilograms shall be taken as 150 kN.

*The mass of 1500 kg is taken as being more representative of the vehicle population than the extreme value of 2500 kg.

(3) Where the car park has been designed for a vehicle exceeding 2500 kilograms the following values shall be used to determine the force F:

m = the actual mass of the vehicle for which the car park is designed in kilograms.

v = 4.47 m/s.

δ_c = 100mm unless better evidence is available.

(4) The impact force provided under paragraph (2) or (3) above shall be considered to act at bumper height. In the case of car parks intended for motor cars not exceeding 25010 kilograms this shall be taken as 375 millimetres the floor level.

NOTE:

* The mass of 1500 kg is taken as being more representative of the vehicle population than the extreme value of 2500 kg.

+The force in the paragraph (5) above is only half that of paragraph (2) or (3) because although the speed of vehicles may be greater the angle of impact is likely to be less. At the ends of straight ramps however not only is the speed likely to be greater but the angle of impact will also be greater so that the barrier must withstand a greater force is therefore double that given in paragraph (2) or (3).

(5) barriers to access ramps of car parks shall be designed to withstand one half* of the force determined in paragraph (2) or (3) above acting at a height of 610 millimetres above the ramp. Opposite the ends of straight ramps intended for downward travel which exceed 20 metres in length the barrier shall be designed to withstand twice + the force determined in paragraph (2) or (3) above acting at the height of 610 millimetres above the ramp.

(6) The recommendations in these By-laws may be used to form the basis of designs either within or beyond the usual serviceability limits of materials.

72. Basement walls and floors.

(1) In the design of basement walls and similar underground structures, provision shall be made for the lateral pressure of adjacent soil, due allowance being made for possible surcharge from fixed or moving loads.

(2) When the portion, or the whole, of the adjacent soil is below a free water surface, computations shall be based on the weight of the soil diminished by buoyancy plus full hydrostatic pressure.

(3) In the design of basement floors and similar structures underground, the upward pressure of water, if any, shall be taken as the full hydrostatic pressure applied over the entire area.

(4) The hydrostatic head shall be measured from the underside of the construction.

73. Foundations.

(1) The foundations of a building shall---

(a) safely sustain and transmit to the ground the combined dead load, imposed load and wind load in a such manner as not to cause any settlement beyond the limits designed for or other movement which would impair the stability of, or cause damage to, the whole or any part of the building or of the any adjoining building or works;

(b) be taken down to such a depth, or be so constructed, as to safeguard the building against damage by swelling and shrinking of the subsoil; and

(c) be capable of adequately resisting any attack-by sulphates or any other deleterious matter present in the subsoil.

(2) The requirements of paragraph (1) shall be deemed to be satisfied if the foundations of a building are constructed in accordance with the relevant recommendation of the BSCP 2004---Foundations.

74. Foundations of buildings not exceeding four storeys.

If the foundations form part of a building other than a factory or storage building, having not more than four storeys the requirements of by-law 73 shall be deemed to be satisfied if such foundations are constructed in accordance with BSCP101 ---Foundations and Substructures for Non-Industrial Buildings not more than Four Storeys.

75. Reinforced concrete foundations.

The requirements of by-law 73 shall be deemed to be satisfied as to such part of any foundation as is constructed of reinforced concrete if the work complies with BSCP 110--- The Structural Use of Concrete, BSCP 114, BSCP 115 or BSCP 116, where applicable.

76. Strip foundations.

If the foundations of a building are constructed as strip foundations of plain concrete situated centrally under the walls, the requirements of by-law 74 shall be deemed to be satisfied if---

(a) there is no made ground or wide variation in the type of subsoil within the loaded area and no weaker type of soil exists below the soil on which the foundations rest within such a depth as may impair the stability of the structure;

(b) the width of the foundation is not less than the width specified in the Fourth Schedule to these By-laws;

(c) the concrete is composed of cement and fine and coarse aggregate conforming to BS 882 and is of a nominal mix not learner than 50 kilograms cement: 0.3 cubic metre all-in aggregate;

(d) the thickness of the concrete is not less than its projection from the base of the wall or footing and is in no case less than 150 millimetres;

(e) where the foundations are laid at more than one level, at each change of level, the higher foundations extend over the unite with the lower foundations for a distance not less than the thickness of the foundations and in no case less than 300 millimetres; and

(f) where there is a pier, buttress or chimney forming part of a wall, the foundations project beyond the pier, buttress or chimney on all sides to at least the same extent as they project beyond the wall.

77. Brick footings.

(1) Where brick footings are provided in the foundations of a wall, they shall be in regular off-sets of 50 millimetres wide and the height from the bottom of such footings to the base of the wall shall be equal to at least two-thirds of the thickness of the wall at its base. Wherever possible, the bricks in the footings shall be laid as headers.

(2) Brick footings in the foundations of a wall may be omitted if allowance is made for such omission in the thickness of the concrete foundations for the wall.

(3) Where in the opinion of the submitting person ground conditions are favourable, the foundations for non-load bearing internal walls may be formed by increasing the depth of the concrete floor slabs under such internal walls.

78. Foundations below invert of drains.

(1) When a building or part of a building is erected at a distance from the centre of a drain less than the depth of the drain, except where the whole of such building is carried on piles other than timber piles, the bottom of the foundation of such building or part thereof shall be stepped down within an

angle of 45? so that the bottom of the foundation of that part of the building situated within the aforesaid distance shall be at least 450 millimetres below the drain invert.

(2) For the purpose of paragraph (1) of by-law 77, in framed building, the foundations shall be deemed to be foundations under the load-bearing columns.

79. Foundations under external and party walls.

Where an external wall is built against another external wall or against a party wall, the widths of concrete foundations specified in the Fourth Schedule to these By- Laws shall be modified accordingly.

80. Structure above foundations.

(1) The structure of a building above the foundation shall be designed and constructed to safety sustain and transmit to the foundations the combined dead and imposed loads and wind loads without such deflection or deformation as will impair the stability of, or cause damage to, the whole or any part of the building.

(2) The requirements of paragraph (1) shall be deemed to be satisfied if the design and construction of the structure or part of the structure complies with the following Codes of Practice of Standard Specifications:

BS 449	The Use of Structural Steel in Building;
BSCP 110	The Structural Use of Concrete;
BSCP 111	Structural Recommendations for Load Bearing Walls;
BSCP 114	Structural Use of Reinforced Concrete in Building;
BSCP 115	The Structural Use of Pre-stressed Concrete in Buildings;
BSCP 116	The Structural Use of Precast Concrete;
BSCP 117	Composite Construction in Structural Steel and Concrete;
BSCP 118	The Structural Use of Aluminium;
BSCP 2007	Design and Construction of Reinforced and Pre-stressed Concrete Structure for the Storage of Water and other Aqueous Liquids;
BS 5337	The Structural Use of Concrete for Retaining Aqueous Liquids; and
MSCP	The Structural Use of Timbers.

PART VI
CONSTRUCTIONAL REQUIREMENTS

81. Building site.

(1) No building shall be erected on any site which has been filled up with any matter impregnated with faecal, animal or vegetable matter, until the whole ground surface or site of such building such has been rendered or become innocuous and has been covered with a layer of hill earth, hardcore, clinker or ash rammed solid to at least 0.305 metre thickness.

(2) The ground to be built upon by any building shall be effectively cleared of turf and other vegetable matter.

82. Drainage of subsoil.

(1) Wherever the dampness or position of the site of a building renders it necessary, the subsoil of the site shall be effectively drained or such other steps shall be taken as will effectively protect the building against damage from moisture.

(2) Where, during the making of an excavation for a building, existing subsoil drains are discovered, such drains shall either be diverted or replaced by pipes of approved material to ensure the continual passage of subsoil water through such drains in such a manner as to ensure that no subsoil water entering such drains causes dampness to the site of the building.

83. Protection against soil erosion, etc.

(1) All air-wells and open spaces in and around buildings shall be suitably protected against soil erosion.

(2) All ground under raised buildings shall be suitably finished and graded to prevent the accumulation of water or the growth of unwanted vegetation or for the breeding of vermin.

84. Prevention of dampness.

(1) Suitable measures shall be taken to prevent the penetration of dampness and moisture into a building.

(2) Damp proof courses where provided shall comply with BS 743 (materials for Horizontal D.P.C.)

(3) Every brick or masonry wall of a building founded an strip footings shall be provided with a damp proof course which shall be-

> *(a)* at a height of not less than 150 millimetres above the surface of the ground adjoining the wall; and
>
> *(b)* beneath the level of the underside of the lowest timbers of the ground floor resting on the wall, or where the ground floor is a solid floor, not higher than level of the upper surface of the concrete or other similar solid material forming the structure of the floor.

(4) Where any part of a floor of the lowest or only storey of a building is below the surface of the adjoining ground and a wall or part of a wall of the storey is in contact with the ground-

(a) the wall or part of the wall shall be constructed or provided with a vertical damp proof course so as to be impervious to moisture from its base to a height of not less than 150 millimetres above the surface of the ground; and

(b) an additional damp proof course shall be inserted in the wall or part of the wall at its base.

(5) Where the floor or any part of the walls of a building is subject to water pressure, that portion of the floor or wall below ground level shall be waterproof.

85. Nominal thickness of walls.

For the purposes of this Part wherever references are made to the thickness of any brick wall, the maximum or minimum thickness of such wall shall not exceed the nominal thickness plus or minus the maximum tolerance permissible under any standard specification.

86. Party walls.

(1) All party walls shall generally be of not less than 200 millimetres total thickness of solid masonry or *insitu* concrete which may be made up of two separate skins each of not less than 100 millimetres thickness if constructed at different times:

Provided that in multi-storeyed flats and terrace houses of reinforced concrete or of protected steel framed construction having floors and roofs constructed to the requirements of these By-Laws, the party wall thereof shall not be less than 100 millimetres total thickness.

(2) Party walls in single storeyed houses may be in load-bearing 100 millimetres solid masonry or *insitu* concrete provided the requirements of Part V, VI and VII of these By-laws are complied with.

(3) All party walls shall be carried above the upper surface of the roof to a distance of not less than 230 millimetres at right angles to such upper surface.

(4) Other non-combustible materials may be used for party walls provided the requirements of Part V, VI and VII of these By-laws are complied with.

87. Openings in party walls.

(1) Openings may be made or left in a party wall if-

(a) such openings may be made with the consent of and in accordance with the requirements of the local authority; and

(b) the owners of the properties concerned give written permission.

(2) Every opening in a party wall shall be solidly built up with brick or stonework to the full thickness of the party wall and properly bonded therewith when the use of such opening is discontinued.

88. Recess.

Where are recess is made in an external wall or a party wall-

(a) the wall at the back of the recess shall be not less than 100 millimetres thick in an external wall and 200 millimetres thick in a party wall;

(b) a sufficient arch or lintel of incombustible material shall be built in every storey over the recess;

(c) in each storey the total area of recesses to be of less thickness than that prescribed by these By-laws shall not exceed one-half of the superficial area of the wall; and

(d) the side of the recess nearest to the inner face of a return external wall, shall be not less than 300 millimetres therefrom.

89. Chases.

A chase made in a wall for pipes and other service facilities shall leave the wall at the back of the chase not less than 100 millimetres thick in external walls and not less than 100 millimetres thick in a party wall and shall be not wider than 200 millimetres.

90. Underpinning.

If underpinning is required the owner or his agent shall-

(a) give written notice to the local authority informing of the fact and stating the method of underpinning proposed to be used;

(b) obtain the written sanction of the local authority thereof before proceeding with the work; and

(c) comply with the requirements as set out in these By-laws.

91. Coping, etc, to be impervious.

(1) Every coping, cornice or other like projection shall be of brick, tile, stone concrete, cement render or other impervious material.

(2) Every parapet wall, free-standing wall or boundary wall shall be finished on top with an impervious material.

92. Projections in brickwork.

All projections in brickwork shall be corbelled but gradually and no projection shall extend more than 230 millimetres from the face of any wall unless built in strong cement mortar.

93. Measurement of the length of a wall.

For the purposes of these By-laws-

(a) walls shall be deemed to be divided into distinct lengths by return walls when bonded to each other;

(b) the length of a wall shall be measured from centre to centre of-

(i) cross walls bonded to it; or

(ii) piers therein having a dimension measured parallel to the length of the wall of not less than twice the thickness of the wall and a dimension measured at right angles to the wall of not less than three times the thickness of the wall.

94. Use of 100 millimetres brickwork and concrete blocks in load-bearing.

Walls built of burnt bricks or of cement bricks 100 millimetres in thickness and walls in concrete blocks of a thickness of not less than 100 millimetres may be used for both internal and external load-bearing walls provided they are designed in accordance with by-law 80.

95. External panel walls.

In all cases where 100 millimetres brickwork or 100 millimetres precast concrete blocks are used for external panel walls, such walls shall be properly secured to the reinforced concrete framework.

For the purpose of this by-law the expression "properly secured to the reinforced concrete framework" means bonding the wall panel to the reinforced concrete column with a metal tie of at least 14 gauge and 40 millimetres width, built at least 230 millimetres into the brickwork with vertical spacings of not more than 400 millimetres. All metal ties shall be securely fixed to the column.

96. Non load-bearing partition.

Every non load-bearing partition shall be adequately restrained or buttressed.

97. Timber built into party walls.

No timber such as joists, beams, wall plates, tile battens and ties shall be built into the thickness of any party wall unless there are not less than 100 millimetres of brickwork or cement between such timbers.

98. Fences and boundary walls.

Fences or walls to the boundaries of detached properties other than the boundary which abuts the street of backlane shall be constructed to a maximum height of 1.8 metres in the case of solid fences or walls and to a maximum height of 2.75 metres in the case of fences which are so constructed as to permit the passage of light and air.

99. Cooking facilities in residential buildings.

(1) Every residential building and every floor of a residential building which is or may be separately let for dwelling purposes shall be provided with a kitchen having a properly constructed fireplace with a flue and chimney as may be required by the local authority.

(2) The chimney and smoke flue shall be continued up above the roof and shall be of a thickness all round of not less than 100 millimetres of brick or concrete to a height of not less than 1.2 metres above the highest point in the line of junction with the roof.

(3) Flues shall be not less than 230 millimetres in diameter and a separate flue shall be provided for each fireplace.

100. Cooking facilities in quarters.

(1) In the case of one room or two room quarters for labourers, artisans or servants, a kitchen not less than 2.32 square metres in floor area may be provided. Such kitchen shall be provided with a properly constructed fireplace, flue and chimney, and shall be adequately lighted and ventilated.

(2) Where it is intended to install in any residential building or floor in a residential building as specified in by-law 99 gas, electric or oil cookers for cooking purposes and the plan for such building is endorsed accordingly, fireplaces, flues and chimneys shall not be required.

(3) For the purposes of by-laws 99 and 100, the expression "properly constructed fireplaces" means a concrete slab not less than 80 millimetres thick supported on brick or concrete piers with a smoke hood over such concrete slab constructed of incombustible materials at a height of 1.91 metres from the floor to the lower edge of such smoke hood. The smoke hood shall project 230 millimetres on each side and in front of the slab and shall be constructed with an angle of inclination of not less than thirty degrees.

101. Boilers fire-places, forges and incinerators in factories.

Boilers, fireplaces, furnaces, forges, incinerators and other similar heat generating appliances used in buildings other than residential buildings shall be provided with adequate means for conveying the heat and fumes generated by such appliances so as to discharge into the open by means of properly constructed flues or ducts of fire resisting material of at least two hours rating in accordance with BS 476 Part 3.

102. Combustible materials adjoining smoke flues.

Combustible materials used in the construction of the building shall be at least 80 millimetres clear of any casing to any flue required for the conveyance of smoke or other products of combustion.

103. Timber floors.

(1) Where structural timber floors are permissible under these By-Laws they shall be designed of hardwood or of species of timber treated with a suitable wood preservative.

(2) All timber floors joists shall be designed in accordance with these By-laws.

(3) All timber trimming joists shall be at least 25 millimetres thickness than the joist of the adjoining floor.

104. Bearing for joints.

(1) All joists shall have at least 100 millimetres bearing on the walls and where supported on corbelled brickwork, such corbelling shall be continuous over-sailing courses. Separate corbels shall not be allowed.

(2) No joists shall be built into the thickness of any party wall unless there is at least 100 millimetres of fire resisting material between the sides and end of such timbers.

(3) All ends of joists built into walls shall be treated with wood preservative.

105. Space below floors to be ventilated.

where the ground floor of any building is constructed with timber joists and flooring boards, the space below the floor shall be adequately ventilated.

106. Dimensions of staircases.

(1) In any staircase, the rise of any staircase shall be not more than 180 millimetres and the tread shall be not less than 255 millimetres and the dimensions of the rise and tread of the staircase so chosen shall be uniform and consistent throughout.

(2) The widths of staircases shall be in accordance with by-law 168.

(3) The depths of landings shall be not less than the width of the staircases.

107. Handrails.

(1) Except for staircases of less than 4 risers, all staircases shall be provided with at least one handrail.

(2) Staircases exceeding 2225 millimetres in width shall be provided with intermediate handrail for each 2225 millimetres of required width spaced approximately equally.

(3) In building other than residential buildings, a handrail shall be provided on each side of the staircase when the width of the staircase is 1100 millimetres or more.

(4) All handrails shall project not more than 100 millimetres from the face of the finished wall surface and shall be located not less than 825 millimetres and not more than 900 millimetres measured from the nosing of the treads provided that handrails to landings shall not be less than 900 millimetres from the level of the landing.

108. Maximum flights.

(1) In residential buildings, a landing of not less than 1.80 metres in depth shall be provided in staircases at vertical intervals of not more than 4.25 metres and in staircases in all other buildings there shall be not more than sixteen risers between each such landing.

(2) No part in any flight of any staircase shall have less than two risers.

109. Winders.

(1) Subject to the provisions of Part VII and VIII of these By-laws spiral staircases may be permitted as a secondary staircase in buildings where the topmost floor does not exceed 12.2 metres in height.

(2) Winding staircase may be permitted where they are not used as a required means of egress.

110. No obstruction in staircases.

(1) There shall be no obstruction in any staircase between the topmost landing thereof and the exit discharge on the ground floor

(2) There shall be no projection, other than handrails in staircases, in any corridor, passage or staircase at a level lower than 2 metres above the floor or above any stair.

111. Lighting and ventilation of staircases.

All staircases shall be properly lighted and ventilated according to the requirements of the local authority.

112. Enclosure of staircases in a shop.

In a shop, the flight of stairs which has access direct from the street shall be enclosed with walls in incombustible material.

113. Use of timber staircases.

(1) Timber staircases may be permitted for the following types of buildings which are not more than three storeys in height:

(a) detached residential buildings;

(b) semi-detached residential buildings;

(c) terrace houses;

(d) in the upper floors of shophouses other than from the ground floor to the first floor provided that it is located within the protected area for its full height; and

(e) other similar types of buildings of limited fire risk at the discretion of the local authority.

(2) All other staircases shall have a fire-resistance rating of not less than two hours.

114. Timber roofs.

(1) Structural timber for roof construction shall be designed and constructed of timbers of adequate sizes which shall either be in hardwood or, if in other species of timber, shall be treated by a suitable wood preservative.

(2) All built-in or concealed roof timbers shall be coated with wood preservative.

115. Roof coverings and drainage.

All roofs of buildings shall be so constructed as to drain effectually to suitable and sufficient channels, gutters, chutes or troughs which shall be provided in accordance with the requirements of these By-Laws for receiving and conveying all water which may fall on and from the roof.

116. Accessible flat roofs, balconies, etc

Every flat roof, balcony or other elevated areas 1.8 metres or more above the adjacent area where normal access in provided shall be protected along the edges with suitable railings, parapets or similar devices not less than 1 metre in height or other suitable means.

117. Access to roof space.

(1) Where the space beneath a roof is enclosed by a ceiling, access to such space shall be provided by means of a trap door at least 0.75 metre in any direction.

(2) No verandah-way shall be constructed except to levels approved by the local authority and shall have a cross-fall of 25 millimetres towards the road or drain

118. Refuse chutes and alternate means for disposal of refuse.

(1) All residential buildings which are four storeys and above shall be provided with refuse chutes unless alternate means for the disposal of refuse such as container-based systems, in-sink waste disposal units, Garcheys system and one-site compression systems are installed.

(2) Where such alternative means of refuse disposal are installed, they are subject to the approval of the local authority.

(3) Where refuse chutes are to be provided, the number shall be determined by the local authority.

(4) For non-residential buildings, no refuse chutes will be permitted. The removal of refuse and trash in such buildings shall be by way of the service lift or other means to the satisfaction of the local authority.

(5) In multi-purpose buildings containing residential accommodation, refuse chutes shall be provided for the residential portions running through the building, but no openings will be permitted where such chutes pass through the non-residential portions of the building.

(6) Other alternate means for the disposal of refuse as stated in paragraph (1) to the local authority may be provided to serve the residential portions of the building.

119. Change of use of building.

(1) When the use of a building is charged from non-residential to residential, refuse chutes or other alternate means for the disposal of refuse shall be provided to the satisfaction of the local authority.

(2) Where the use of a building is charged from residential to non-residential, the openings into existing refuse chute serving the converted floors shall be sealed up.

120. Design and construction of refuse chutes.

The design and construction of all refuse chutes shall conform to the following requirements:

(a) the chute shall be vertical for the whole length and shall be constructed with a smooth-finished impervious inner surface;

(b) the internal diameter shall not be less than 400 millimetres;

(c) adequate ventilation at the top of the chute shall be provided;

(d) the chute shall discharge into a suitable metal receptacle or receptacles of not more than 0.95 cubic metre in capacity or as specified by the local authority;

(e) openings into any refuse chute shall be fitted with a self-closing and tight-fitting flap or hopper; and

(f) openings into refuse chutes shall not be located in any stairway enclosure or corridor, nor in a stairway protected lobby.

121. Requirements for refuse receptacle chambers.

All refuse receptacles shall be housed in a chamber which shall-

(a) be provided with concrete curbs for the refuse receptacles to stand on;

(b) be adequately fly and vermin proofed;

(c) be connected to and drained by a foul water drain;

(d) open to the external air;

(e) be lined throughout with glazed tiles; and

(f) be located near to a water point.

122. Access to refuse receptacle chambers.

The approach access to the loading point from refuse chute chambers for the removal of refuse vehicles shall be at gradient to enable the refuse vehicles to approach it and shall be to the approval of the local authority;

Provided that where direct access to refuse chutes for refuse vehicles is not possible, specific points for storing refuse receptacles shall be provided to the satisfaction of the local authority.

123. Pipes and service ducts.

(1) Where ducts or enclosures are provided in any building to accommodate pipes, cables or conduits the dimensions of such ducts or enclosures shall be-

(a) adequate for the accommodation of the pipes, cables or conduits and for crossings of branches and mains together with supports and fixing; and

(b) sufficiently large to permit access to cleaning eyes, stop cocks and other controls there to enable repairs, extensions and modifications to be made to each or all of the service accommodated.

(2) The access openings to ducts or enclosures shall be long enough and suitably placed to enable lengths of pipe to be installed and removed.

124. Lifts.

For all non-residential buildings exceeding 4 storeys above or below the main access level at least one lift shall be provided.

125. Swimming pool.

(1) The floor and wall surfaces of swimming pools shall be smooth and free from cracks.

(2) Swimming pools shall be completely surrounded by an overflow channel constructed so that-

(a) the overflow and any matter floating therein cannot return directly to the swimming pool;

(b) the arms or legs of swimmers cannot be trapped by the overflow channel; and

(c) swimmers can take hold of the edge of the overflow channel but so that the depth of the overflow channel does not enable the bottom of the overflow channel to be touched with the fingers.

126. Steps and footway.

(1) Steps shall be situated at the side walls near the ends of the swimming pool and shall be so arranged that they are not higher than the internal facing of the walls of the swimming pool, such steps being constructed of non-ferrous materials with a non-slip surface and provided with a handrail.

(2) A footway with a non-slip surface shall be provided round every swimming pool.

127. Opening into swimming pool.

The openings by which the water enters a swimming pool shall be distributed in such a manner that circulation of the water in the swimming pool is uniform and dead points of stagnant place avoided.

128. Depth of water.

(1) Swimming pools shall have lines marked on the side walls of swimming pool to indicate-

(a) the depth of the water at the shallow and deep ends of the swimming pool;

(b) the part of the swimming pool where the depth of the water is between 1.3 metres and 1.8 metres; and

(c) the depth of the water shown in figures over the lines marked on the side of the swimming pool above the overflow channel of the swimming pool.

(2) The water in swimming pools with diving boards or platforms shall have the following minimum depths as measured at any point within the swimming pool 1.53 metres from the free end of the diving boards or platforms:

(a) for diving boards up to 3 metres above the level of the water, such minimum depth shall be 3.3 metres; and

(b) for platforms up to 9.7 metres above the level of the water, such minimum depth shall be 4.5 metres.

129. Location of boards.

Diving boards, platforms and water chutes in the swimming pool shall be situated not less than 1.8 metres from the sides of the swimming pool or from any other diving board, platform or water chute in the swimming pool.

130. Changing rooms.

(1) Swimming pools shall have separate changing rooms for each sex.

(2) The flooring of such changing rooms shall be of a non-slip impermeable material, easy to clean, and graded to drainage outlets sufficient to enable water used therein for cleaning purposes to be rapidly drained.

(3) The walls of such changing rooms shall be smooth, impermeable, and easy to clean up to height of 1.8 metres.

131. Foot-baths and shower.

These shall be provided around the swimming pool sufficient numbers of footbaths of not less than 0.9 metre each in any dimension with a shower situated over the entrance there to and such foot-bath shall be provided with running water.

132. Private, residential swimming pools.

By-laws 125 to 131 shall apply to public and commercial swimming pools and not to private, residential or special purpose swimming pools, the approval of which shall be at the discretion of the local authority.

PART VII
FIRE REQUIREMENTS

133. Interpretations.

In this part and Part VIII unless the context otherwise requires-

"automatic" means a device or system providing an emergency function without the necessity of human intervention:

"balcony approach" means a balcony being an external approach to a common staircase serving one or more occupancies;

"boundary" in relation to building, means the boundary of the land belonging to the building (such land being deemed to include any abutting part of a street, canal or river but only up to the centre line thereof); and boundary of the premises shall be construed so as to include any such part to the same extent;

"circulation space" means any space which is solely or predominantly used as a means of between a room and a protected shaft or between either a room or a protected shaft and exit from the building or compartment;

"compartment" means any part of a building which is separated from all other parts by one or more compartment walls or compartment floors or by both such walls and floors; and for the purposes of the Part, if any part of the top storey of a building is within a compartment, the compartment shall also include any room space above such part of the top storey;

"compartment walls" and "compartment floor" mean respectively a wall and a floor which comply with by-law 148, and which are provided as such for the purposes of by-law 136 to divide a building into compartments for any purpose in connection with by-law 213 or 147;

"D.G.F.S." means the Director General of Fire Services, Malaysia or the relevant Fire Authority;

"dead-end" means an area from which escape is possible in one direction only and in an open plan includes any point from which the direct routes to alternative exists subtend an angle of less than 45 degrees;

"designated floor" means the floor level at which the fire brigade has access to the fire lifts and will normally be the floor level closest to the fire appliance access level;

"directed distance" means the shortest distance from any point within the floor area measured within the external enclosures of the building to the relevant exit disregarding walls, partitions of fitting other than the enclosing walls or partitions to protected staircases;

"door" includes any shutter, cover or cover form of protection to an opening in any wall or floor of a building, or in the structure surrounding a protected shaft, whether the doors is constructed of one or more leaves;

"dry rising system" means a vertical water main which is normally dry, of appropriate size, and fitted with hydrant outlets which can be charged with water by the Fire Authority's pumps via a fire service inlet and shall comply with BS 3980 and BSCP 402.101;

"element of structure" means-

(a) any member forming part of the structural frame of a building or any other beam or column (not being a member forming part of a roof structure only);

(b) a floor, including a compartment floor, other than the lowest floor of a building;

(c) an external wall;

(d) a separating wall;

(e) a compartment wall;

(f) structure enclosing a protected shaft;

(g) a load-bearing wall or load-bearing part of a wall; and

(h) a gallery

"emergency lighting" means the illumination obtained through either an independent or secondary source of electricity supply such as trickle charged accumulators or separate generators to the normal or duplicate lighting;

"exit discharge" means a door from a storey, flat, or room which door gives access from such storey, flat or room on to an exit route;

"exit door" means a door from a storey, flat, or room which door gives access from such storey, flat or room on to an exit route;

"exit route" means a route by which persons in any storey of a building may reach a place of safety outside the building and may include a room, doorway corridor, stairway or other means of passage not being a revolving door, lift or escalator;

"externally non-combustible" means externally faces with, or otherwise externally consisting of non-combustible material;

"final exit" means a point of discharge for the escape route from a building providing direct access to the street, passage-way or open steps sited to enable the evacuation of persons from the vicinity of a building so that they are safe from fire or smoke;

"fire alarm installation" means an installation capable of warning persons of an outbreak of fire. Such installation must have detectors conforming to the Rules of the Fire Officers' Committee for Automatic Fire Alarm Installation, and installed in accordance with BSCP 1019;

"fire appliance access level" means the level at which fire appliances can approach the building for purposes of fire fighting or evacuation of occupants;

"fire fighting access level" means the highest level at a fire appliance ladder may be brought against a building for purposes of fire fighting and evacuation;

"fire fighting access lobby" means a lobby separated from the storey it serves by construction of a FRP of at least half hour, directly accessible from a fire fighting staircase and a fire lift and containing a dry or wet riser;

"fire fighting staircase" means a staircase designated as a recognised means of access into the building for firemen in the event of a fire;

"fire hydrant" means an installation of pipes, water tanks, pumps and hydrant outlets in a building to provide a ready means by which a jet of water can be delivered in any part of the building for the purposes of fire fighting and to comply with BSCP 402.101;

"fire lifts" means lift capable of being commandeered for exclusive use of firemen in emergency;

"firemen's switch" means a switch located adjacent to the fire lift by the designated floor to enable the fire brigade to gain control of the fire lifts;

"fire resistance" has the meaning ascribed to it in by-law 221;

"fire resistance period" means the period for which an element will meet the requirements in respect of transmission of heat or resistance to collapse with passage of flame when tested in accordance with BS 476; Part 1: 1953;

"fire resisting" means the construction so designated, including doors, has a minimum standard of fire-resistance of not less than half hour in accordance with the relevant Schedules of these BY-laws or which achieves such standard when tested in accordance with BS 476: Part 8: 1972 except that, in the case of the doors-

(a) the rabbets to the door frame or the door stops whichever may be are not less than 18 millimetres deep; and

(b) the door is hung on metal hinges having a melting point of not less than 800?C,and

(c) the door is rendered self-closing;

"fire stop" means a barrier or seal which would prevent or retard the passage of smoke or flame within a cavity or around a pipe or duct where it passes through a wall or floor or at a junction between elements of structure;

"F.O.C." means Fire Officers' Committee of the United Kingdom;

"FRP" means fire resistance period;

"height of a building" has the meaning ascribed to it in by-law 135;

"horizontal exit" is a means of egress from a compartment or building to an adjacent compartment or building on approximately the same level and thence to a protected staircase or final exit either direct or via a protected corridor;

"hose reel installation" means an installation of pipes, water-tanks, pumps and hose reels in a building to provide a ready means by which a jet of water can be delivered in any part of the building for the purpose of fire fighting and to comply with BSCP 402.101;

"interior finish" means the exposed interior surface of buildings including, but not limited to fixed or movable walls, partitions, columns and ceilings;

"non-combustible" shall apply to materials as specified under BS 476: Part 4 (1970);

"permitted limit of unprotected areas" means the maximum aggregate area of unprotected areas in any side or external wall of a building or compartment, which complies with the requirements as set out in the Sixth Schedule to these By-laws for such building or compartment;

"protected corridor" means a corridor separated from the building it serves by partitions having FRP of not less than half hour and which partitions have all openings therein fitted with fixed lights and self-closing doors each having a FRP of not less than half hour;

"protected lobby" means a lobby enclosed throughout by partitions having an FRP of not less than half hour and has all openings therein fitted with fixed lights and self-closing doors having an FRP of not less than half hour;

"protected shaft" means a stairway, lift, escalator, chute, duct or other shaft which enables persons, things or air to pass between different compartments; and which complies with the requirements of by-law 150;

"protected staircase" means a staircase separated from the building it serves by partitions having an FRP of not less than half hour and which has all openings in such partitions fitted with fixed lights and self-closing doors each having an FRP of not less than half hour;

"protecting structure" means any wall or floor or other structure which encloses a protected shaft other than-

(a) a wall which also forms part of an external wall, separating wall or compartment wall; or

(b) a floor which is also a compartment floor or a floor laid directly on the ground; or

(c) a roof;

"relevant boundary " in relation to a side or external wall of a building or compartment, means that part of the boundary of the premises or the notional boundary as prescribed in by-law 146 which is adjacent to that side or wall and either coincides with, is parallel to or is at an angle of not more than 80? with that side or wall;
"separating wall" means a wall or part of a wall which is common to two adjoining buildings;

"smoke lobby" means a protected lobby being the approach to a staircase and which acts as a fire and smoke check between a storey and the staircase;

"smoke stop door" means a door or pair of doors which when fitted in a frame satisfies the requirements of Section 7 of BS 476; Part 8: 1972 as to-

(a) freedom from collapse for not less than thirty minutes; and

(b) resistance to the passage of flame and hot gases for not less than twenty minutes;

and which is fitted so that the clearance between the leaf and frame and in the case of double doors also between the two leaves, is as small as is reasonably practical, and except in the case of doors hung to open in both directions, is provided with a rabbet to the door frame or with a door stop, which in either case is not less than 25 millimetres deep;

"sprinkler installation" means an installation of water supplies, pump, pipes, valves and delivery points so arranged as to automatically detect a fire and attack it with water, sound an alarm and installed in accordance with the current edition of the F.O.C. Rules for Automatic Sprinkler Installations or other approved standards;

"staircase external" means a staircase which is completely open to the external air on at least two sides from the level of the top of the balustrade to the underside of the flight of stairs immediately above;

"staircase internal" means a staircase enclosed on all sides by partitions of walls and which has all openings in the internal walls glazed or otherwise protected from the weather;

"storey exit" means a fire rated door to a protected staircase or a corridor protected with a fire resisting structure in accordance with the Ninth Schedule to these By-laws and in the case of ground floor accommodation storey exit means a door leading direct to a place of safety outside the building;

"travel distance" means the distance required to be traversed from any point in a storey of a building to either-

(a) the fire-resisting door in the staircase enclosure; or

(b) if there is no such door, the first stair tread of the staircase;

"unprotected area" in relation to an external wall or side of a building, means-

(a) a window, door or other opening;

(b) any part of the external wall which has fire resistance less than that specified by this Part for the wall; and

(c) any part of the external wall which has combustible material more than 1.5 millimetres thick attached or applied to its external face, whether for cladding or any other purpose;

"wet rising system" means any permanently charged vertical water main installed for fire-fighting purposes, of an appropriate size and fitted with connections suitable for use by the Fire Authority and to comply with the requirements of BSCP 402.101.

134. Designation of purpose groups.

For the purpose of this Part every building or compartment shall be regarded according to its use or intended use as falling within one of the purpose groups set out in the Fifth Schedule to these By-laws and, where a building is divided into compartments, used or intended to be used for different purposes, the purposes group of each compartment shall be determined separately:

Provided that where the whole or part of a building or compartment, as the case may be, is used or intended to be used for more than one purpose, only the main purpose of use of that building or compartment shall be taken into account in determining into which purpose group it falls.

135. Rules of measurement.

In this Part-

(a) the height of a building, or of such of a building as described in by-law 215 means the height of such building or part, measured from the mean level of the ground adjoining the outside of the external walls of the building to the level of half the vertical height of the roof of the building or part, or to the top of the walls of the parapet (if any), whichever is the higher;

(b) the area of-

(i) any storey of a building or compartment shall be taken to be the total area in that storey bounded by the finished inner surfaces of the enclosing walls or, of any side where there is no enclosing wall, by the outermost edge of the floor on that side;

(ii) any room or garage shall be taken to be the total area of its floor bounded by the inner finished surfaces of the walls forming the room or garage;

(iii) any part of a roof shall be taken to be the actual visible area of such part measured on a plane parallel to the pitch of the roof;

(c) the cubic capacity of a building or compartment shall be ascertained by measuring the volume of space contained within-

(i) the finished inner surfaces of the enclosing walls or, on any side where there is no enclosing wall, a plane extending vertically above the outermost edge of the floor on that side;

(ii) the upper surface of its lowest floor; and

(iii) in the case of a building or of a compartment which extends to a roof, the under surface of the roof or, in the case of any other compartments, the under surface of the ceiling of the highest storey within the compartment, including the space occupied by any other walls, or any shafts, ducts or structure within the space to be so measured.

136. Provisions of compartment walls and compartment floors.

Any building, other than a single storey building, of a purpose group specified in the Fifth Schedule to these By-laws and which has-

(a) any storey the floor area of which exceeds that specified as relevant to a building of that purpose group and height; or

(b) a cubic capacity which exceeds that specified as so relevant shall be so divided into compartments, by means of compartment walls or compartment floors or both, that-

(i) no such compartment has any storey the floor area of which exceeds the area specified as relevant to that building; and

(ii) no such compartment has a cubic capacity which exceeds that specified as so relevant to that building:

Provided that if any building is provided with an automatic sprinkler installation which complies with the relevant recommendations of the F.O.C. Rules for Automatic Sprinkler Installation, 29th edition, this by-law has effect in relation to that building as if the limits of dimensions specified are doubled.

137. Floor in building exceeding 30 metres in height to be constructed as compartment floor.

In any building which exceeds 30 metres in height, any floor which is more than 9 metres above ground floor level which separates one storey from another storey, other than a floor which is either within a maisonette or a mezzanine floor shall be constructed as a compartment floor.

138. Other walls and floors to be constructed as compartment walls or compartment floor.

The following walls and floors in building shall be constructed as compartment walls or compartment floors:

(a) any floor in a building of Purpose Group II (Institutional);

(b) any wall or floor separating a flat or maisonnette from any other part of the same building;

(c) any wall or floor separating part of a building from any other part of the same building which is used or intended to be used mainly for a purpose falling within a different purpose group as set out in the Fifth Schedule to these By-laws; and

(d) any floor immediately over a basement storey if such basement storey has an area exceeding 100 square metres.

139. Separation of fire risk area.

The following areas or uses shall be separated from the other areas of the occupancy in which they are located by fire resisting construction of elements of structure of a FRP to be determined by the local authority based on the degree of fire hazard;

(a) boiler rooms and associated fuel storage areas;

(b) laundries;

(c) repair shops involving hazardous processes and materials;

(d) storage areas of materials in quantities deemed hazardous;

(e) liquified petroleum gas storage areas;

(f) linen rooms;

(g) transformer rooms and substations;

(h) flammable liquids stores.

140. Fire appliances access.

All building in excess of 7000 cubic metres shall abut upon a street or road or open space of not less than 12 metres width and accessible to fire brigade appliances. The proportion of the building abutting the street, road or open space shall be in accordance with the following scale:

Volume of building in cubic meter	Minimum proportions of perimeter of building
7000 to 28000	one-sixth
28000 to 56000	one-fourth
56000 to 84000	one-half
84000 to 112000	three-fourths
112000 and above	island site

141. Separating walls.

(1) Subject to the exceptions specified in paragraph (2) no openings shall be made in any separating wall which forms a complete vertical wall separating any buildings.

(2) Nothing in this by-law shall prohibit-

(a) the passage through a separating wall of a pipe, if the pipe-

(i) is not a flue pipe;

(ii) has a diameter not exceeding 25 millimetres if it is made of combustible material or 150 millimetres, if it is made of non-combustible material; and

(iii) is fire stopped where it passes through the wall; or

(b) an opening in a separating wall which is necessary as a means of escape from fire, if the opening is fitted with a door which has in respect of separating walls FRP of not less than that required in this Part.

(3) Any separating wall which forms, a junction with a roof shall be carried above the upper surface of the roof to a distance of not less than 225 millimetres measured at right angles to such upper surface.

142. External walls.

(1) If any external wall is carried across the end of a separating wall, such external wall and separating wall shall be bonded together or the junction of such walls shall be fire-stopped.

(2) Subject to the provisions relating to small garages and open car parks, any side of a building shall comply with any relevant requirements relating to the permitted limits of unprotected areas specified in the Sixth Schedule to these By-laws unless the building is so situated that such side might consist entirely of any unprotected area.

(3) Any external wall which constitutes, or is situated within a distance of 1 metre from any point on the relevant boundary or is a wall of a building which exceeds 15 metres in height shall-

(a) be constructed wholly of non-combustible materials apart from any external cladding which complies with by-law 144 or any internal lining which complies with these By-laws; and

(b) be so constructed as to attain any FRP required by this Part without assistance from any combustible material permitted by this Part-

Provided that the requirements of this Part shall not apply to-

(i) an external wall of a building which is within the limits of size indicated by the letter "x" in Part 1 of the Ninth Schedule to these By-laws or an external wall of a building which is not divided into compartments and is within the limits of size indicated by the letter "z" in Part 2 of the Ninth Schedule if, in either case, that building does not exceed 18 metres in height; and

(ii) an external wall of a building or part of Purpose Group III which consists of flats or maisonettes if that building has not more than three storeys or that

part is separated as described in by-law 135 and does not exceed 18 metres in height.

143. Beam or column.

Any beam or column forming part of, and any structure carrying, and external wall which is required to be constructed of non-combustible materials shall comply with the provisions pf paragraph (3) of by-law 142 as to non-combustibility

144. Cladding on external wall.

(1) Any cladding on any external walls, if such cladding is situated less than 1.2 metres from any point on the relevant boundary, shall have a surface complying with the requirements for Class O specified in by-law 204.

(2) Any cladding on any external wall situated 1.2 metres or more from the relevant boundary shall, if the building is more than 18 metres in height, have a surface complying with the requirements specified for Class O in by-law 204 except that any part of such cladding below the height of 18 metres from the ground may consist of timber of not less than 10 millimetres finished thickness or of a material having a surface which, when tested in accordance with BS 476: Part 6: 1968, has an index of performance not exceeding twenty.

145. Reference to Sixth Schedule.

For the purpose of by-law 142 to 146-

(a) any part of a roof shall be deemed to be part of an external wall or side of a building if it is pitched to an angle of 70? or more to the horizontal and adjoins a space within the building to which persons have access not limited to the purposes of maintenance or repair: and

(b) any reference to the Sixth Schedule to these By-laws shall be construed as referring to the provisions of Part 1 of the Schedule together with, at the option of the persons intending to erect the building, either the provisions of Part II, Part III or Part IV of the Schedule.

146. Relevant boundary.

If any building is to be erected on land occupied with any other building, or two or more detached buildings are to be erected on land in common occupation and either of those buildings is within Purpose Group I or III, other than a detached building which consists only of a garage or of an open car park, in the application of the provisions of this Part to any external wall of any building to be erected which Faces an external wall of such other building-

(a) the relevant boundary shall be a notional boundary passing between those buildings and such boundary must be capable of being situated in such a position as to enable the external walls of those buildings to comply with the requirements of this Part; and

(b) if such other building is an existing building it shall be deemed to be (a building to be) erected on the site which it occupies, being of the same purpose and having the same unprotected areas and fire resistance as the existing building.

147. Construction of separating wall.

(1) Any separating wall, other than a wall separating buildings not divided into compartments within the limits of size indicated by the letter "x" in Part I of the Ninth Schedule to these By-laws, shall be constructed wholly of non-combustible materials, excluding any surface finish to a wall which complies with the requirements of these By-laws and the required FRP for the wall shall be obtained without assistance from such non-combustible material.

(2) Any beam or column forming part of, and any structure carrying, a separating wall which is required to be constructed of non-combustible materials shall itself comply with the requirements of paragraph (1) as to non-combustibility.

148. Special requirements as to compartment walls and compartment floors.

(1) No opening shall be made in any compartment wall or compartment floor with the exception of any one or more of the following:

(a) an opening fitted with a door which complies with the requirements of by-law 162 and has FRP which is not less than-

(i) in the case of a wall separating a flat or maisonette from any space in common use giving access to that flat or maisonette, half hour; or

(ii) in any other case, the FRP required by the provisions of these By-laws in respect of the wall or floor;

(b) an opening for a protected shaft;

(c) an opening for a ventilation duct, other than a duct in, or consisting of, a protected shaft, if any space surrounding the duct is fire-stopped and the duct is fitted with an automatic fire damper in accordance with Australian Standard 1682 and 1668 Part I-1974 or its equivalent where it passes through the wall or floor which fire damper shall have not less than the required FRP of the material of the compartment wall or floor through which it passes;

(d) an opening for a pipe which complies with the requirements of paragraph (2) of by-law 141;

(e) an opening for a refuse chute having a FRP of at least one hour and having a close-fitting door situated in an external wall of the chamber having a FRP of half-hour.

(2) Where a compartment wall or compartment floor forms a junction with any structure comprising any other compartment walls, or any external wall, separating wall or structure enclosing a protected shaft, such structures shall be bonded together at the junction or the junction shall be fire-stopped.

(3) Where any compartment wall forms a junction with a roof, such wall shall be carried to the under surface of the roof covering.

(4) Where any chimney, appliance ventilation duct or duct encasing one or more flue pipes passes through a compartment floor or compartment wall-

(a) any flue in the chimney; or

(b) the passage in the appliance ventilation duct; or

(c) the space within the duct encasing the flue pipe or pipe,

shall be separated from that compartment floor or that compartment wall and from each compartment adjoining that wall or floor by non-combustible construction having FRP of not less than half the minimum FRP required by these By-laws in respect of that compartment wall or compartment floor through which such chimney, duct or pipe passes.

(5) If any chimney, appliance ventilation duct or duct encasing one or more flue pipes forms part of a compartment wall-

(a) any flue in the chimney; or

(b) the passage in the appliance ventilation duct; or

(c) the space within the duct encasing the flue pipe or pipes,

Shall be separated from any compartment adjoining that wall by non-combustible construction which will, at any level, have FRP of not less than half the minimum FRP required by these By-laws in respect of the compartment wall at that level.

(6) Any compartment wall or compartment floor which is required by these By-laws to have FRP of one hour or more shall, excluding-

(a) any floor finish;

(b) any surface finish to a wall or ceiling which complies with the requirements of by-law 204; or

(c) any ceiling which complies with the descriptions specified in the Ninth Schedule to these By-laws,

be constructed wholly of non-combustible materials and, apart from any ceiling, the required FRP of the wall or floor shall be obtained without assistance from any non-combustible material.

(7) Any beam or column forming part of, and structure carrying, any compartment wall or compartment floor which is required to be constructed of non-combustible materials, shall itself comply with the provisions of paragraph (6) as to non-combustibility.

149. Horizontal and vertical barriers of the external walls.

Openings in external located vertically above one another shall be protected by approved flame barriers either extending 750 millimetres beyond the interior wall in the plane of the floor or by vertical panels not less than 90 millimetres in height.

150. Protected shafts.

(1) No protected shaft shall be constructed for use for any purposes additional to those specified in this Part other than for the accommodation of any pipe or duct, or as sanitary accommodation or washrooms, or both.

(2) Subject to the provisions of this Part, any protected shaft shall be completed enclosed.

(3) Any protecting structure which is required to have a FRP of one hour or more, and any beam or column forming part of that structure and any structure carrying such protecting structure shall be constructed of non-combustible materials throughout, with the exception of any external surface finish which complies with the requirements of by-law 204 relating to wall surfaces.

(4) Any wall, floor or other structure enclosing a protected shaft but not being a protecting structure may contain such openings as shall be in accordance with other provisions of these By-laws.

(5) There shall be no opening in any protecting structure other than any one or more of the following:

(a) an opening for a pipe;

(b) an opening fitted with a fire-resisting door which complies with the provisions of By-law 162;

(c) if the protected shaft contains a lift, an openings which complies with the provisions of by-law 162; and

(d) if the protected shaft serves as, or contains a ventilating duct, an inlet to or outlet from the duct or an opening for the duct.

(6) Any opening for pipe shall be effectively fire-stopped.

151. Ventilation to lift shafts.

Where openings to lift shafts are not connected to protected lobbies, such lift shafts shall be provided with vents of not less than 0.09 square metre per lift located at the top of the shafts. Where the vent does not discharge directly to the open air the lift shafts shall be vented to the interior through a duct of the required FRP as for the lift shafts.

152. Openings in lift shafts.

(1) Every opening in a lift shaft or lift entrance shall open into protected lobby unless other suitable means of protection to the opening to the satisfaction of the local authority is provided. These requirements shall not apply to open type industrial and other special buildings as may be approved by the D.G.F.S.

(2) Landing doors shall have a FRP of not less than half the FRP of the hoistway structure with a minimum FRP of half hour.

(3) No glass shall be used for in landing doors except for vision in which case any vision panel shall or be glazed with wired safety glass, and shall not be more than 0.0161 square metre and the total area of one of more vision panels in any landing door shall be not more than 0.0156 square metre.

(4) Each clear panel opening shall reject a sphere 150 millimetres in diameter.

(5) Provision shall be made for the opening of all landing doors by means of an emergency key irrespective of the position of the lift car.

153. Smoke detectors for lift lobbies.

(1) All lift lobbies shall be provided with smoke detectors.

(2) Lift not opening into a smoke lobby shall not use door reopening devices controlled by light beam or photo-detectors unless incorporated with a force close feature which after thirty seconds of any interruption of the beam causes the door to close within a preset time.

154. Emergency mode of operation in the event of mains power failure.

(1) On failure of mains power all lifts shall return in sequence directly to the designated floor, commencing with the fire lifts, without answering any car or landing calls and park with doors open.

(2) After all lifts are parked the lifts on emergency power shall resume normal operation:

Provided that where sufficient emergency power is available for operation of all lifts, this mode of operation need not apply.

155. Fire mode of operation.

(1) The fire mode of operation shall be initiated by a signal from the fire alarm panel which may be activated automatically by one of the alarm devices in the building or manually.

(2) If mains power is available all lifts shall return in sequence directly to the designated floor, commencing with the fire lifts, without answering any car or landing calls, overriding the emergency stop button inside the car, but not any other emergency or safety devices, and park with doors open.

(3) The fire lifts shall then be available for use by the fire brigade on operation of the fireman's switch.

(4) Under this mode of operation, the fire lifts shall only operate in response to car calls but not to landing calls in a mode of operation in accordance with by-law 154.

(5) In the event of mains power failure, all lifts shall return in sequence directly to the designated floor and operate under emergency power as described under paragraphs (2) to (4).

156. Protected shafts as ventilating duct.

(1) If a protected shaft serves as, or contains, a ventilating duct-

> *(a)* the duct shall be fitted with automatic fire dampers together with or without sub-ducts as Australian Standard 1668: Pt.1: 1974, so constructed at such intervals and in such positions as may be necessary to reduce, so far as a practical, the risk of fire spreading from a compartment to any other compartment, or such other provision shall be made as will reduce such risk so far as practicable; and
>
> *(b)* the duct shall not be constructed of, or lined with, any material which substantially increase such risk.

(2) In addition, in the case of a protected shaft containing a ventilating duct, the shaft be so constructed with additional barriers to fire between the duct and the shaft as may be necessary to reduce so far as practicable the risk of fire spreading from a compartment to any other compartment.

157. Protected shafts consisting of staircase.

A protected staircase or a protected shaft containing a staircase shall not contain any pipe conveying gas or oil or any ventilating duct other than a duct serving only that stair-case or shaft.

158. Stages in places of assembly.

(1) In places of assembly, other than school halls or other similar halls where stage scenery is infrequently used, capable of seating more than 400 persons and in which stage scenery may be used, the stage shall be separated from the auditorium by a proscenium wall of not less than 225 millimetres brickwork or other material of equivalent FRP, carried down to a solid foundation and up to at least 0.92 metres above the roof level unless the roof is constructed of materials having the FRP as specified in the Ninth Schedule to these By-laws.

(2) No more than three openings inclusive of the proscenium opening shall be provided in the proscenium wall.

(3) No opening additional to the proscenium opening shall be more than 0.61 metres above the level of the stage nor shall such additional opening have an area exceeding 1.858 square metres and each such additional opening shall be fitted with a door constructed of materials having the FRP as specified in the Ninth Schedule to these By-laws.

159. Open stages.

Open stages without proscenium walls may be permitted provided suitable protection devices to the satisfaction of the D.G.F.S. are installed.

160. Fire precautions in air conditioning systems.

(1) All air conditioning ducts, including framing there for, except ducts in detached and semi-detached residential buildings shall be constructed entirely of non-combustible materials and shall be adequately supported throughout their lengths.

(2) No air-conditioning ducts shall pass through fire walls unless as provided for in by-laws 148 and 156.

(3) The air intake of any air-conditioning apparatus shall be situated such that air shall not be re-circulated from any space in which objectionable quantities of inflammable vapours or dust are given off and shall be so situated as to minimise the drawing in of any combustible material.

161. Fire-stopping.

(1) Any fire stop required by the provisions of this Part shall be so formed and positioned as to prevent or retard the passage of flame.

(2) Any fire stop shall-

> *(a)* if provided around a pipe or duct or in a cavity, be made of non-combustible material or, if it is in a floor or wall constructed of combustible material, of timber not less than 37 millimetres thick; and

(b) if provided around a pipe or duct, be so constructed as not to restrict essential thermal movement.

(3) Any fire stop formed as a seal at the junction of two or more elements of structure shall be made of non-combustible material.

(4) Any cavity in an element of structure which-

(a) is continuous through the whole or part of such element: and

(b) has a surface of combustible material exposed within the cavity which is of a class lower than Class O in by-law 204 shall be fire stopped-

(i) at any junction with another element of structure or with a ceiling under a roof; and

(ii) in such a position that there is no continuous cavity without a fire stop which in one plane exceeds either 7.625 metres in a single dimension or 23.225 square metres in area;

but nothing in this by-law shall prohibit the insertion of combustible filling in a cavity.

162. Fire doors in compartment walls and separating walls.

(1) Fire doors of the appropriate FRP shall be provided.

(2) Openings in compartment walls and separating walls shall be protected by a fire door having a FRP in accordance with the requirements for that wall specified in the Ninth Schedule to these By-laws.

(3) Openings in protecting structures shall be protected by fire doors having FRP of not less than half the requirement for the surrounding wall specified in the Ninth Schedule to these By-laws but in no case less than half hour.

(4) Openings in partition enclosing a protected corridor or lobby shall be protected by fire doors having FRP of half-hour.

(5) Fire doors including frames shall be constructed to a specification which can be shown to meet the requirements for the relevant FRP when tested in accordance with section 3 of BS 476: 1951.

163. Half hour and one hour doors.

Fire doors conforming to the method of construction as stipulated below shall be deemed to meet the requirements of the specified FRP:

(a) doors and frames constructed in accordance with one of the following specifications shall be deemed to satisfy the requirements for doors having FRP of half-hour:

(i) a single door 900 millimetres wide X 2 100 millimetres high maximum or double doors 1 800 millimetres X 2 100 millimetres high maximum constructed of solid hardwood core of not less than 37 millimetres laminated with adhesives conforming to either BS 745 "Animal Glues", or BS 1204, "Synthetic resin adhesive (phenolic and aminoplastic) for wood" Part 1, "Gap-filling adhesives " or BS 1444, "Cold-setting casein glue for wood", faced both sides with plywood to a total thickness of not less

than 43 millimetres with all edges finished with a solid edge strip full width of the door. The meeting stiles of double doors shall be rabbeted 12 millimetres deep or may be butted provided the clearance is kept to a minimum;

(ii) doors may be double swing provided they are mounted on hydraulic floor springs and clearance at floor not exceeding 4.77 millimetres and frame and meeting stiles not exceeding 3 millimetres;

(iii) a vision panel may be incorporated provided it does not exceed 0.065 square metre per leaf with no dimension more than 1 370 millimetres and it is glazed with 6 millimetres Georgian Wired Glass in hardwood stops;

(iv) doors constructed in accordance with BS No. 459; Part 3: 1951 Fire Check Flush Doors and Wood and Metal Frames (Half-Hour Type);

(v) timber frames for single swing half-hour fire doors of overall width of 60 millimetres including 25 millimetres rabbet and depth to suit door thickness plus 34 millimetres stop;

(vi) metal frames for half-hour fire doors shall be of sheet steel not lighter than 18 gauge of overall width 50 millimetres including 18 millimetres rabbet and depth to suit the door thickness plus 53 millimetres stop;

(vii) timber or metal frames for double swing doors shall be as specified above with minimum clearances between frame and door;

(b) doors and frames constructed in accordance with one of the following specifications shall be deemed to satisfy the requirements for doors having FRP of one hour;

(i) a single door not exceeding 900 millimetres wide X 2100 millimetres high or double doors not exceeding 1800 millimetres X 2100 millimetres high constructed as for specification *(a)* for half-hour door but incorporating on both faces either externally or beneath the plywood faces a layer of asbestos insulating board to BS 3536 (not asbestos cement) not less than 3 millimetres thick;

(ii) doors may swing one way only and double doors shall have 12 millimetres wide rabbet at the meeting stiles;

(iii) a vision panel may be incorporated provided it does not exceed 10 square metres per leaf with no dimension more than 300 millimetres and it is glazed with 6 millimetres Georgian Wire Glass in hardwood stop;

(iv) doors constructed in accordance with Bs 459: Part 3: 1951: Fire Check Flush Doors and Wood and Metal Frames (One Hour Type):

(v) frames for one hour doors shall be as for half-hour doors except that timber frames shall be pressure impregnated with 15% to 18% solution of mono-ammonium phosphate in water.

164. Door closers for fire doors.

(1) All fire doors shall be fitted with automatic door closers of the hydraulically spring operated type in the case of swing doors and of wire rope and weight type in the case of sliding doors.

(2) Double doors with rabbeted meeting stiles shall be provided with co-ordinating device to ensure that leafs close in the proper sequence.

(3) Fire doors may be held open provided the hold open device incorporates a heat actuated device to release the door. Heat actuated devices shall not be permitted on fire doors protecting openings to protected corridors or protected staircases.

165. Measurement of travel distance to exits.

(1) The travel distance to an exit shall be measured on the floor or other walking surface along the centre line of the natural path of travel, starting 0.300 metre from the most remote point of occupancy, curving around any corners or obstructions with 0.300 metre clearance therefrom and ending at the storey exit. Where measurement includes stairs, it shall be taken in the plane of the trend noising.

(2) In the case of open areas the distance to exists shall be measured from the most remote point of occupancy provided that the direct distance shall not exceed two-thirds the permitted travel distance.

(3) In the case of individual rooms which are subject to occupancy of not more than six persons, the travel distance shall be measured from the doors of such rooms:

Provided that the travel distance from any point in the room to the room door does not exceed 15 metres.

(4) The maximum travel distances to exits and dead end limits shall be as specified in the Seventh Schedule of these By-laws.

166. Exits to be accessible at all times.

(1) Except as permitted by by-law 167 not less than two separate exits shall be provided from each storey together with such additional exits as may be necessary.

(2) The exists shall be so sited and the exit access shall be so arranged that the exits are within the limits of travel distance as specified in the Seventh Schedule to these By-laws and are readily accessible at all times.

167. Storey exits.

(1) Except as provided for in by-law 194 every compartment shall be provided with at least two storey exits located as far as practical from each other and in no case closer than 4.5 metres and in such position that the travel distances specified in the Seventh Schedule to these By-laws are not exceeded.

(2) The width of storey exits shall be in accordance with the provisions in the Seventh Schedule to these By-laws.

168. Staircases.

(1) Except as provided for in by-law 194 every upper floor shall have means of egress via at least two separate staircases.

(2) Staircases shall be of such width that in the event of any one staircase not being available for escape purposes the remaining staircases shall accommodate the highest occupancy load of any one floor discharging into it calculated in accordance with provisions in the Seventh schedule to these By-laws.

(3) The required width of a staircase shall be the clear width between walls but handrails may be permitted to encroach on this width to a maximum of 75 millimetres.

(4) The required width of a staircase shall be maintened throughout its length including at landings.

(5) Doors giving access to staircases shall be so positioned that their swing shall at no point encroach on the required width of the staircase or landing.

169. Exit route.

No exit route may reduce in width along its path of travel from the storey exit to the final exit.

170. Egress through unenclosed openings.

Where unenclosed openings are permitted between floors and for a mezzanine floor, egress may be by way of an open staircase to an adjacent floor and thence to a story exit:

(a) the layout is such that a fire originating anywhere within the compartment will be obvious to the occupants of all communicating levels or areas;

(b) the travel distances specified in the Seventh Schedule to these by-laws are not exceeded;

(c) only 50% of the occupants of a floor are assumed to use the open staircase and storey exits are provided at every level to accommodate the other 50% of the occupants of that level in accordance with the provisions of the Seventh Schedule to these by-laws; and

(d) the storey exits on the principal floor through with other levels discharge are designed to handle the occupants of that floor plus 50% of the occupants from the adjacent levels discharging through it.

171. Horizontal exits.

(1) Where appropriate, horizontal exits may be provided in lieu of other exits.

(2) Where horizontal exits are provided protected staircases and final exits need only be of a width to accommodate the occupancy load of the larger compartment or building discharging into it so long as the total number of exit widths provided is not reduced to less than half that would otherwise be required for the whole building.

(3) For institutional occupancies the total exit capacity other than horizontal exits shall not be reduced by more than one-third that would otherwise be required for the entire area of the building.

172. Emergency exit signs.

(1) Storey exits and access to such exits shall be marked by readily visible signs and shall not be obscured by any decorations, furnishings or other equipment.

(2) A sign reading "KELUAR" with an arrow indicating the direction shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

(3) Every exit sign shall have the word "KELUAR" in plainly legible letters not less than 150 millimetres high with the principal strokes of the letters not less than 18 millimetres wide. The lettering shall be in red against a black background.

(4) All exit signs shall be illuminated continuously during periods of occupancy.

(5) Illuminated signs shall be provided with two electric lamps of not less than fifteen watts each.

173. Exit doors.

(1) All exit doors shall be openable from the inside without the use of a key or any special knowledge or effort.

(2) Exit doors shall close automatically when released and all door devices including magnetic door holders, shall release the doors upon power failure or actuation of the fire alarm.

174. Arrangement of storey exits.

(1) Where two or more storey exits are required they shall be spaced at not less than 5 metres apart measured between the nearest edges of the openings.

(2) Each exit shall give direct access to---

(a) a final exit;

(b) a protected staircase leading to a final exit; or

(c) an external route leading to a final exit.

(3) Basements and roof structures used solely for services need not be provided with alternative means of egress.

175. Calculation of occupancy loads.

Calculation of occupancy loads and capacity of exits shall be in accordance with the provisions of the Seventh Schedule to these By-laws.

176. Computing storey exit width.

To compute the required exit width from individual floors of a building---

(a) calculate the floor area net or gross whichever is applicable;

(b) determine the allowable occupancy load factor from Table;

(c) divide the floor area by the number of square metre per person to determine the number of persons for which exits must be provided for that floor;

(d) determine from the table the capacity of the type of exit to be used for the purpose group being designed; and

(e) calculate the number of units of exit width for each type of exit used based upon the capacity.

177. Computing number of staircases and staircase width.

The following factors shall be used in computing the exit widths:

(a) in a multi-storeyed building if x units of exit width are required from each floor the staircases serving those floors do not need to be x times the number of floors served in units of exit width. The staircases need to be only wide enough to serve each floor but not less than the minimum width allowed and in every case one of the protected staircases shall be assumed to be inaccessible and the remaining protected staircase shall be of sufficient width and number to accommodate the relevant occupancy;

(b) depending on the occupancy, street floor exits have to be sized to handle not only the occupant load of the street floor but also the percentage of the load of the exits discharging to the street floor from floors above and below;

(c) exits should never decrease in width along their length of travel and, if two or more exits converge into a common exit, the common exit should never be narrower than the sum of the width of the exits converging into it;

(d) except as provided in these By-laws, the minimum number of exits is two;

(e) at least one of the staircases should be minimum of two units width except that 900 millimetres may be allowed where total occupancy of all floors served by staircases is less than 50; and

(f) there should be no decrease in width along the path of travel of a staircase.

178. Exits for institutional and places of assembly.

In buildings classified as institutional or places of assembly, exits to a street or large open space, together with staircases, corridors and passages leading to such exits shall be located, separated or protected as to avoid any undue danger to the occupants of the place of assembly from fire originating in the other occupancy or smoke therefrom

179. Classification of places of assembly.

Each place of assembly shall be classified according to its capacity as follows:

Class A Capacity	1,000 persons or more
Class B Capacity	300 to 1,000 persons
Class C Capacity	100 to 300 persons

180. Space standards for calculating occupancy loads.

The occupancy load permitted in any place of assembly shall be determined by dividing the net floor area or space assigned to the use by the square metre per occupant as follows:

(a) assembly area of concentrated use without fixed seats such as an auditorium, places of worship, dance floor and lodge room 0.65 square metre per person;

(*b*) assembly area of less concentrated use such as a conference room, dining room, drinking establishment, exhibit room, gymnasium, or lounge 1.35 square metre per person;

(*c*) standing room or waiting space 3 square metres per person;

(*d*) the occupancy load of an area having fixed seats shall be determined by the number of fixed seats installed. Required aisle space serving the fixed seats shall not be used to increased the occupant load.

181. Width of means of egress.

Means of egress shall be measured in units of exits width of 552 millimetres. Fractions of a unit shall not be counted, except that 300 millimetre added to one or more full units shall be counted as one half of a unit exit width and no individual access to exit shall be less than 700 millimetres.

182. Rate of discharge.

The rate of travel per floor of persons shall be sixty persons per minute through doors or along level passage ways and forty-five persons per minute down stairs.

183. Exit details for places of assembly.

Every place of assembly, every tier or balcony and every individual room used as a place of assembly shall have exits sufficient to provide for the total capacity thereof as determined in accordance with by-law 180 and as follows:

(a) no individual unit of exit width shall serve more than one hundred persons;

(b) doors leading outside the building at ground level or not more than three risers above or below ground one hundred persons per exit unit;

(*c*) staircases or other types of exit not specified in by-law 177 above seventy-five persons per exit unit;

(*d*) every Class A place of assembly (capacity one thousand persons or more) shall have at least four separate exits as remote from each other as practicable;

(*e*) every Class B place of assembly (capacity) three hundred to one thousand persons) shall have at least two separate
exits as remote from each other as practicable, and if of a capacity of over six hundred at least three such exits;

(*f*) every Class C place of assembly (capacity one hundred to three hundred persons) shall have at least two means of exit, consisting of separate exits or doors leading to a corridor or other space giving access to separate exits in different direction.

184. Seating.

(1) *(a)* The spacing of rows of seats from back to back shall be not less than 825 millimetres, nor less than 675 millimetres plus the sum of the thickness of the back and inclination of the back.

(b) There shall be a space of not less than 300 millimetres between the back of one seat and the front of the seat immediately behind it as measured between plumb-lines.

(c) Rows of seats between gangways shall have not more than fourteen seats.

(d) Rows of seats opening on to a gangway at one end only shall have not more than seven seats.

(e) Seats without dividing arms shall have their capacity determined by allowing 450 millimetres per person.

(2) *(a)* With Continental seating the spacing of rows of unoccupied seats shall provide a clear width between rows measured horizontally as follows (automatic or self-rising seats shall be measured in the seat-up position, other seats shall be measured in the seat-down position):

450 millimetres clear width between rows of 18 seats or less;

500 millimetres clear width between rows of 35 seats or less;

525 millimetres clear width between rows of 45 seats or less;

550 millimetres clear width between rows of 46 seats or more.

(b) With continental seating, the number of intervening seats between any seat and a gangway may be increased to 49 where exit doors are provided along each side gangway of the row of seats at the rate of 1 pair of exit doors for each 5 rows of seat. Such exit doors shall provide a minimum clear width of 1680 millimetres.

185. Gangway in places of assembly.

(1) A clear gangway not less than 1200 millimetres in width shall be provided around the stalls and balcony in a place of assembly leading to exit doors therein:

Provided that if the gangways in the balcony lead to exit doors not less than 1200 millimetre in width the rear gangway may be omitted.

(2) Gangways not less than 1200 millimetres wide running parallel to the rows of seating in a place of assembly shall be provided where required by the local authority.

(3) All floors of balconies or tiers in a place of assembly shall be constructed entirely of reinforced concrete.

(4) Steps shall not be used to overcome differences in level in a gangway in a place of assembly unless the slope of such gangway exceeds one in ten.

(5) Where steps of a pitch exceeding 30? or ramps of a slope exceeding one in ten are provided in gangways flanking the seating in place of assembly, suitable handrails shall be provided.

(6) The treads of steps in gangways in a place of assembly shall have a non-slip surface and the edges of such steps shall be illuminated at step level.

(7) In circles and galleries or areas where the incline exceeds 15?, guard rails not less than 1050 millimetres above floor level shall be provided at the foot of gangways in places of assembly.

186. Exit doors in places of assembly.

(1) All doors used by the public as exit doors from any part of the place of assembly or leading to the open air, shall open only in the direction of exit.

(2) In place of assembly all exit doors and doors through which the public pass on the way to the open air shall be without lock, bolts or other fastenings while the public are in the building:

Provided that doors used for exit only may be fitted with panic bolts.

(3) Panic bolts fitted to doors in a place of assembly shall be not less than 750 millimetres or more than 1100 millimetres above the floor.

(4) Turnstiles, if installed in a place of assembly, shall be arranged clear of the line of exit, and shall not be included in the calculation of exit width.

(5) In a place of assembly every external door used by the public and every collapsible gate shall be capable of being locked in the fully open position in such a way that a key is required to release such door or gate from such open position.

187. Notice affixed to door or gate.

A notice or notices so arranged as to be visible from both sides of the door, gate or shutter whether the door, gate or shutter is in the open or in the closed position shall be affixed to, or in position adjacent to every door and gate referred to above, such notice bearing the words "This gate/door is required to be kept open and locked in that position during the whole time the audience/gathering is in the building" . The height of the lettering for such notice shall not be less than 75 millimetres.

188. Travel distance in place of assembly.

Exits in any place of assembly shall be arranged that the travel distance from any point to reach an exit shall not exceed 45 metres for un-sprinkled buildings and 60 metres for sprinkled buildings.

189. Enclosing means of escape in certain buildings.

(1) Every staircase provided under these By-laws in a building of four storeys or more, or in a building where the highest floor level is more than 1200 millimetres above the ground level, or in any place of assembly, or in any school when such staircase is to be used as an alternative means of escape shall be enclosed throughout its length with fire resisting materials.

(2) Any necessary openings, except openings in external walls which shall not for the purposes of this by-law include walls to air-wells, in the length of such staircase shall be provided with self-closing doors constructed of fire-resisting materials.

190. External staircase.

Any permanently installed external staircase is acceptable as a required exit under the same condition as an internal staircase:

Provided that such staircase shall comply with all the requirements for internal staircase. External staircase shall be separated from the interior of the building by walls and fire door of the same fire resistance rating as required for internal staircase.

191. Openings in adjacent walls not permitted.

(1) No opening shall be permitted to be formed in the walls adjacent to any external staircase within a distance of 2 metres measured horizontally and 9 metres measured vertically below the staircase.

(2) Ventilation openings to toilets or other protected areas are however exempted from this restriction.

(3) Where windows or other glazed openings are required within these dimension, they shall be fitted with wired glass and be kept in permanently closed position.

192. Moving walks.

(1) An inclined moving walk exit shall comply with the applicable requirements of ramps

(2) No moving walk capable of being operated in the direction contrary to normal exit travel shall be used as a means of egress.

193. Power operated doors as means of egress.

A power operated door shall only be regarded as a means of egress if it is possible to be swung in the direction of exit travel by manual means.

194. Building with single staircase.

A single staircase may be permitted in any building the top most floor of which does not exceed 12 metres in height:

Provided that such building complies with the following conditions:

(*a*) each element of structure shall have a FRP of not less than one hour;

(*b*) no room or storey of the building may be used for any occupancy other than for domestic or office purpose, except that the ground storey may be used for the purposes of a shop or car park;

Provided that

(i) the staircase from the ground to first floor level shall be separated from the remainder of the ground floor by a wall having a FRP of not less than two hours;

(ii) the wall enclosing the staircase at the main entrance be returned for a distance of not less than 450 millimetres along the frontage of any shop or car park;

(iii) the maximum travel distance shall be 12 metres measured from the door of the room or area to the exit provided the path of travel from any point in the room to the room door does not exceed 12 metres;

(iv) in ground and first storeys which have windows containing opening lights sufficiently near the adjacent ground level as to make emergency escape by this means reasonable a maximum travel distance up to 30 metres is permissible.

195. Staircases to reach roof level.

In building exceeding 30 metres in height all staircases intended to be used as means of egress shall be carried to the roof level to give access thereto.

196. Smoke lobbies.

(1) Access to a staircase smoke lobby shall be means of fire doors opening in the direction of escape.

(2) The width of the smoke lobby shall at no point be less than the required exit width.

(3) Smoke lobbies shall be provided at the basement levels where an escape staircase serving an upper storey is extended to a basement.

(4) Where practical smoke lobbies and fire fighting access lobbies shall have permanent openings or openable windows of not less than 1 square metre giving direct access to the open air from an external wall or internal light well.

(5) Where natural ventilation is impractical smoke lobbies and fire fighting access lobbies may be ventilated by means of a vertical shaft or mechanically pressurised.

197. Protected lobbies.

(1) Protected lobbies shall be provided to serve staircase in buildings exceeding 18 metres above ground level where the staircase enclosures are not ventilated through external walls.

(2) In buildings exceeding 45 metres above ground level, such protected lobbies shall be pressurised to meet the requirements of Section 7 of the Australian Standard 1668, Part 1–1974 or any other system meeting the functional requirements of the D.G.F.S.

(3) Protected lobbies may be omitted if the staircase enclosures are pressurised to meet the requirements of the by-law 200.

198. Ventilation of staircase enclosures.

(1) All staircase enclosures shall be ventilated at each floor or landing level by either permanent openings or openable windows to the open air having a free area of not less than 1 square metre per floor.

(2) Openable windows shall meet the operational requirements of the D.G.F.S.

(3) In buildings not exceeding three storeys above ground level, staircase enclosures may be unventilated provided that access to them at all levels except the top floor is through ventilated lobbies.

199. Ventilation of staircase enclosures in buildings not exceeding 18 metres.

In buildings not exceeding 18 metres above ground level, staircase enclosures may be unventilated provided that access to them at all levels except the top floor is through ventilated lobbies and the staircase enclosures are permanently ventilated at the top with least 5% of the area of the enclosures.

200. Ventilation of staircase enclosures in buildings exceeding 18 metres.

For staircases in buildings exceeding 18 metres above ground level that are not ventilated in accordance with by-law 198, two alternative methods of preventing the infiltration of smoke into the staircase enclosures may be permitted by providing

(*a*) permanent ventilation at the top of the staircase enclosure of not less than 5% of the area of the enclosure and in addition at suitable intervals in the height of the staircase a mechanically ventilated shaft to achieve not less than 20 air changes per hour to be automatically activated by a signal from the fire alarm panel; or

(*b*) mechanically pressurisation of the staircase enclosure to the standard of performance as specified in section 7 of the Australian Standard 1668, Part 1–1974 or any other system meeting the functional requirements of the D.G.F.S.

201. Staircase enclosures below ground level.

All staircase enclosures below ground level shall be provided with suitable means of preventing the ingress of smoke.

202. Pressurized system for staircases.

All staircases serving buildings of more than 45.75 metres in height where there is no adequate ventilation as required shall be provided with a basic system of pressurization

(*a*) where the air capacity of the fan shall be sufficient to maintain an air flow of not less than 60 metres per minute through the doors which are deemed to be open;

(*b*) where the number of doors which are deemed to be opened at the one time shall be 10% of the total number of doors opening into the staircase with a minimum number of two doors open;

(*c*) where with all the doors closed the air pressure differential between the staircases and the areas served by it shall not exceed 5 millimetres water gauge;

(*d*) where the mechanical system to prevent smoke from entering the staircase shall be automatically activated by a suitable heat detecting device, manual or automatic alarm or automatic wet pipe sprinkle system;

(*e*) which meets the functional requirements as may be agreed with the D.G.F.S.

203. Restriction of spread of flame.

(1) A finished floor or floor covering may be exempted from the requirements of that Part:

Provided that in any case where the authority having jurisdiction finds a floor surface of unusual hazard, the floor surface shall be considered a part of the interior finish for the purposes of this Part.

(2) The classification of interior finish materials specified shall be that of the basic material used, without regard to subsequently applied paint or wall-paper, except that the Fire Authority having jurisdiction shall include such finishes in the determination of classification in any case where in the opinion of the Fire Authority having jurisdiction they are of such character or thickness or so applied as to affect materially flame spread characteristics.

204. Classification of restriction of flame over surface wall and ceiling.

For the purpose of this Part and the Eight Schedule to these By-Laws any reference to a surface being of a specified class shall be construed as a requirement that the material of which the wall, ceiling or soffit is construed, shall comply with the following requirements:

Class O. Surface of no flame spread.

(A) Any reference to a surface being Class O shall be construed as a requirement that

(*a*) the material of which the wall or ceiling is construed shall be non combustible throughout; or

(*b*) the surface material, or if it is blended throughout to a substrate, the surface material in conjunction with the substrate, shall when tested in accordance with BS 476; Part 6, 2968, have an index of performance (A) not exceeding 12 and a sub-index not exceeding 6:

Provided that the face of a plastic material having a softening point less than 120 degrees Centigrade when tested by method 102 C of BS 2782: 1970, shall only be regarded as a surface of Class O if-

(i) the material is bonded throughout to a substrate which is not a plastic material and the material in conjunction with the substrate satisfies the test criteria prescribed in *(a)* above; or

(ii) the material satisfies the test criteria prescribed in (b) above and is used as a lining of a wall so constructed that any surface which would be exposed if this lining were not present, satisfies the said test criteria and is the face of a material other than a plastic material having a softening point less than 120? C.

(B) Any reference to a surface being of a class other than Class O shall be construed as a requirement that the material of which the wall or ceiling is constructed shall comply with the relevant test criteria as to surface spread of flame specified in relation to that class in clause 7 of BS 476: Part 1, Section 2, 1953.

(C) In relation to a requirement that a surface shall be of a class not lower than a specified class, Class O shall be regarded as the highest class followed in descending order by Class 1, Class 2, Class 3 and Class 4.

Class 1. Surface of Very Low Flame Spread.

Those surfaces on which not more than 150 millimetres means spread of flame occurs.

Class 2. Surfaces of Low Flame Spread.

Those surfaces on which during the first 11/2 minutes of test, the mean spread of flame is not more than 375 mm and the final spread does not exceed 450 mm.

Class 3. Surfaces of Medium Flame Spread.

Those surfaces of which, during the first 11/2 minutes of test, the means spread of flame is not more than 375 millimetres and during the first 10 minutes of test is not more than 825 millimetres.

Class 4. Surfaces of Rapid Flame Spread.

Those surfaces on which during the first 11/2 minutes of test, the mean spread of flame is not more than 375 millimetres and during the first 10 minutes of test is more than 825 millimetres.

205. Classification of interior finish materials.

(1) Any material shown by test to have a life hazard greater than that indicated by the flame spread classification owing to the amount or character of smoke generated shall be included in the group shown in by-law 204 appropriate to its actual hazard as determined by the Fire Authority.

(2) Classification of interior finish materials shall be in accordance with tests made under conditions simulating actual installations.

(3) Where a complete standard system of automatic sprinklers is installed, interior finish with flame spread rating not over Class 3 may be used in any location where Class 2 is normally specified, and with rating of Class 2 in any location where Class 1 is normally specified and with rating of Class 1 where Class O is specified.

(4) In all buildings other than private residences Class O or Class 1 interior finish shall be used in all basements or other underground spaces from which there is no direct exit to the outside of the building if subject to occupancy for any purpose other than storage or service facilities.

206. Classification of surface of wall or ceiling.

(1) The surface of a wall or ceiling in a room, circulation space or protected shaft shall be of a class not lower than that specified as relevant in the Eight Schedule to these By-Laws:
Provided that

(*a*) a wall may have a surface of any class not lower than Class 3 to the extent permitted by paragraph (3); and

(*b*) a ceiling may either have a surface of any class not lower than Class 3 to the extent permitted by paragraph (3) or many consist of plastics material to the extent permitted by paragraph (1) of by-law 207.

(2) Any part of the surface of a wall in a room may be of any class not lower than Class 3 if the area of the part, or, if there are two or more such parts, the total area of those parts does not exceed the lesser of the following:

(*a*) half the floor area of the room; or

(*b*) in the case of a building or compartment of Purpose Group I, II, III, 2.2 square metres or in any other case 6.5 square metres.

(3) Any part or the surface of a ceiling may be of any class not lower than Class 3 if that part of the surface is the face of a layer of material the other face of which is exposed to the external air and

(*a*) (i) the ceiling is that of a room in a building or compartment of Purpose Group II, III, IV, V or VII or that of a circulation space in a building or compartment of any purpose group;

(ii) the area of that part does not exceed 2.5 square metres; and

(iii) the distance between that part and any other such part is not less than 4 square metres; or

(*b*) (i) the ceiling is that of a room in a building or compartment of Purpose Group VI or VIII;

(ii) the area of that part does not exceed 5 square metres;

(iii) the distance between that part and other such part is not less than 150 millimetres; and

(iv) the part and all other such parts are evenly distributed over the whole area of the ceiling and together have an area which does not exceed 15% of the floor area of the room; or

(*c*) the ceiling is that of a balcony, verandah, open car park, covered way or loading way which, irrespective of its floor area, has at least one of its longer sides wholly and permanently open; or

(*d*) the ceiling is that of a garage, conservatory or outbuilding which, irrespective of whether it forms part of a building or is a building which is attached to another building or wholly detached, has a floor area not exceeding 44 square metres.

207. Exception relating to ceilings.

(1) Any part of the ceiling of a room or circulation space may consist of

(*a*) rigid polyvinyl chloride sheeting which is classified as self-extinguishing when tested in accordance with test method 508A or BS 2782: 1970 if the face of the sheeting which is not the surface of the ceiling is exposed to the external air; or

(*b*) one or more panels of such plastic materials as are permitted by paragraph (2) if the upper and lower surfaces of any part of the ceiling which is not formed by a panel of plastic material and the surfaces of all other parts of the structure which enclose the space over the ceiling are of a class not lower than that prescribed in the Eight Schedule to these By-law for the ceiling of such a room or circulation space.

(2) Panels to which paragraph (1) *(b)* refers may consist of one or more sheets or membranes of either

(*a*) polyvinyl chloride which has a degree of flammability of not more than 75 millimetres when tested in accordance with method 508C of BS 2782; 1970 or which has very low flammability when tested and classified in accordance with method 508D of BS 2782: 1970, if

(i) the nominal thickness of the sheet or membrane or, if a panel consist of two or more sheets or membranes, their nominal aggregate thickness does not exceed; and 0.99 millimetre; and

(ii) no panel has an area exceeding 4.0876 square metres; or

(*b*) any plastic material which has a softening point of not more than 120?C when tested by method 102C of BS 2782: 1970, and a burning rate of not more than 50 millimetres per minute when tested in a thickness of 3 millimetres in accordance with method 508A of BS 2872: 1970, if

(i) the nominal thickness of the sheet or membrane or, if a panel consists of two or more sheets or membranes, their nominal aggregate thickness does not exceed 30 millimetres;

(ii) the aggregate area of the plastic material, if situated in a building or compartment of Purpose Group II, III or VII, does not exceed 30% of the floor area of floor area of the room or 15% of the floor are of the circulation space, as the case may be, or, if situated in a building or compartment of any other purpose group, does not exceed 50% of the floor area of the room or 15% of the floor area of the circulation space, as the case may be;

(iii) no panel has any side exceeding 4.75 metres in length or an area exceeding 4.4 square metres if situated in a room or 2.0438 square metres if situated in a circulation space but if two or more panels are group so that each is less than 575 millimetres from another, the said maximum dimensions shall be applied to the smallest rectangle which would wholly enclose all such panels; and

(iv) every panel is loosely mounted in such a way that it will fall out of its mountings when softened by heat.

208. Reference to roofs.

Any reference in this Part to a roof or part of a roof of a specified designation shall be construed as meaning a roof or part of a roof so constructed as to be capable of satisfying the relevant test criteria specified in respect of that designation of roof in BS 476. Part 3:

Provided that any roof or part of a roof shall be deemed to be of such a designation if

(*a*) it conforms with one of the specification set out against the designation in the Eight Schedule to these By-law; or

(*b*) a similar part made to the same specification as that roof is proved to satisfy the relevant test criteria.

209. Reference to buildings.

Any reference in this Part to a building shall, in any case where two or more houses adjoin, br construed as a reference to one those houses.

210. Construction of roofs.

(1) No part of the roof of a building which

(*a*) has a cubic capacity exceeding 1416.43 cubic metres;

(*b*) is wholly or partly of Purpose Group VI or VII; or

(*c*) is a house in a continuous terrace of more than two houses;

shall be so constructed as to be designated in accordance with by-law 212 BD, CA, CB, CC, CD, DA, DB, DC or DD, or be covered with attap or wood shingles.

(2) Any part of a roof which is so designated BA, BB, or BC, shall not be less than 2.29 metres from any point on a boundary.

(3) Any part of a roof which is so designated AD, BD, CA, CB, CC, or CD or is covered with attap or wood shingles, shall be not less than 4.58 metres from any point on a boundary unless such part is

(*a*) of an area not exceeding 3 square metres; and

(*b*) separated from any other part of the same roof which is so designated or covered with attap or wood shingles by an area of roof which is at least 1.53 metres wide and which is covered by non-combustible material,

in which case such designated part or parts covered with attap or wood shingles shall be not less than 2.29 metres from any such point.

211. Roofing materials.

(1) If any part of a roof cannot be designated under by-law 208 on account of the low softening temperature of its covering material, such part shall be not less than 12.2 metres ot twice the height of the building, whichever is the greater, form any point on a boundary unless such part is

(*a*) of an area not exceeding 3 square metres; and

(*b*) separated from any other part of the same roof which is covered with the same material or any other material by a distance which is at least 1.53 metres wide and covered with non-combustible material,

in which case such part shall be not less than 6 metres from any such point.

(2) Nothing in this Part shall be prevent any part of a roof being constructed of such glass or rigid polyvinyl chloride sheeting as cannot be designated in accordance with by-law 208 but which, in the case of sheeting, is classified as self-extinguishing when tested in accordance with method 508A of BS 2782: 1970, whether either

(*a*) that part of the roof is not less than 6 metres from any boundary; or

(*b*) that part of the roof is less than 6 metres from any boundary, and the roof is that of a garage, conservatory or outbuilding having a floor area not exceeding 40 square metres whether or not attached to a forming part of another building, or is the roof of, or canopy over, a balcony, verandah, open car-park, covered way or detached swimming pool.

212. Category designation for the fire penetration and spread of flame on roof surface.

Each category designation for roofing material shall consist of two letters, the first letter referring to the fire penetration and the second letter to spread of flame on the roof surface, these being determined as follows:

(*a*) First letter

(i) A-Those specimens which have not been penetrated within 1 hour;

(ii) B-Those specimens which are penetrated in not less than 1/2 hour;

(iii) C-Those specimens which are penetrated in less than 1/2 hour;

(iv) D-Those specimens which are penetrated in the preliminary test.

(*b*) Second letter

(i) A-Those specimens on which there is no spread of flame;

(ii) B–Those specimens on which there is not more than 525 millimetres spread of flame;

(iii) C-Those specimens on which there is more than 525 millimetres spread of flame;

(iv) D–Those specimens which continue to burn for 5 minutes after the withdrawal of the test flame or spread more than 375 millimetres across the region of burning in the preliminary test.

213. Fire Resistance.

Subject as otherwise provided by this Part every element of structure shall be so constructed as to have fire resistance for not less than whichever of the periods specified in the Ninth Schedule to these By-Laws is relevant, having regard to the purpose group of the building of which it forms part and the dimensions specified in that Schedule.

214. Additional requirements.

(1) In addition to any relevant requirements under by-law 213

(*a*) any external wall shall have fire resistance of not less than half-hour; and

(*b*) any separating wall shall have fire resistance of not less than one hour.

(2) Nothing in by-law 213 or paragraph (1) above shall apply to any part of an external wall which in non-load bearing and such external wall may, in accordance with by-law 142, be an unprotected area.

215. Height of buildings.

(1) Subject to the provisions of paragraph (2) and any other express provision to the contrary, any reference to a building of which an element of structure forms part of such building means the building or if a building is divided into compartments any compartment of the building of which the element forms part of such building.

(2) Any reference to height means the height of a building, not of any compartment in the building, but if any part of the building is completely separated throughout its height both above and below ground from all other parts by a compartment wall or compartment walls in the same continuous vertical plane, any reference to height in relation to the part means the height solely of that part.

216. Single storey buildings.

(1) In the case of a single storey building nothing in by-law 213 or in by-law 214 shall apply to any element of structure in a ground storey which consists of

(*a*) a structural frame or a beam or column, provided that any beam or column, whether or not it forms part of a structural frame, which is within of forms part of a wall, and any column which gives support to a wall or gallery, shall have fire resistance of not less than the minimum period, if any, required by these By-laws for the wall or that gallery;

(*b*) an internal load-bearing part of a wall, unless that wall or part is, or forms part of, a compartment wall or a separating wall, or forms part of the structure enclosing a protected shaft or support a gallery; or

(*c*) part of an external wall which does not support a gallery and which may, in accordance with by-law 142 be an unprotected area.

(2) If any element of structure forms part of more than one building or compartment and requirements for fire resistance specified in the Ninth Schedule to these By-laws in respect of one building or compartment differ from those specified in respect to any other building or compartment of which the element forms part, such element shall be so constructed as to comply with the greater or greatest of the requirements specified.

217. Fire resistance of structural member.

Any structural member of overloading wall shall have fire resistance of not less than the minimum period required by these By-laws for any element which it carries.

218. Compartment wall separating flat and maisonette.

Any compartment wall separating a flat or maisonette from any other part of the same building shall not be required to have fire resistance exceeding one hour unless

(*a*) the wall is load-bearing wall or a wall forming part of a protected shaft; or

(*b*) the part of the building from which the wall separates the flat or maisonette is of a different purpose group and the minimum period of fire resistance required by this Part for any element of structure in that part is one and a half hours or more.

219. Application of these By-laws to floors.

In the application of these By-laws to floors, no account shall be taken of any fire resistance attributable to any suspended ceiling other than a suspended ceiling constructed as described in the Ninth Schedule to these By-laws.

220. Floor area and capacity of buildings and compartments.

Where reference is made in this Part to floor areas and capacity of buildings or compartments, the maximum floor area or cubic capacity or the maximum floor area and cubic capacity of the building or compartment may be doubled where the building or compartment is fitted throughout with an automatic sprinkler system, or with such other means of fire protection of not less efficiency in relation to the nature of the building or compartment and its contents, which the fire extinguishing system is required to protect.

221. Test of fire resistance.

(1) For the purposes of this Part requirements as to fire resistance shall be construed as meaning that an element of structure shall be capable of resisting the action of fire for the specified period under the conditions of test appropriate to such element in accordance with BS 476: Part I: subject to such modifications or applications of such conditions of test as are prescribed to these By-laws.

(2) Any compartment floor shall, if the underside of such floor is exposed to test by fire, have fire resistance for not less than the minimum period required by this Part for elements of structure forming part of the compartment immediately below such floor.

222. Fire resistance for walls.

(1) Any structure, other than an external wall, enclosing a protected shaft shall, if each side of the wall is separately exposed to test by fire, have fire resistance for not less than the minimum period required by this Part.

(2) Any compartment wall or separating wall shall, if each side of the wall is separately exposed to test by fire, have fire resistance for not less than the minimum period required by this Part.

(3) Any part of an external wall which constitutes, or is situated less than 0.92 metre from any point on the relevant boundary shall, if each side of the wall is separately exposed to test by fire, have fire resistance for not less than the minimum period required by this Part.

(4) Any part of an external wall which is situated 0.92 metre or more from the relevant boundary and which is required by these By-laws to have fire resistance, shall, if the inside of the wall is exposed to test by fire, have fire resistance for not less than the minimum period required by this Part:

Provided that, for the purposes of these by-laws, the wall shall be capable of satisfying the requirements of clause 11c of section 3 of BS 476: Part 1: relating to insulation, for a period of not less than fifteen minutes.

223. Fire resistance for floors above ground floor.

Any floor above the ground storey of a house falling within Purpose Group 1 shall, if the underside of such floor is exposed to test by fire in accordance with BS 476: Part 1: be capable of satisfying the

requirements of that test as to freedom from collapse for a period of not less than half an hour and as to insulation and resistance to passage of flame for not less than fifteen minutes.

224. Fire resistance for any element of structure.

Any element of structure shall be deemed to have the requisite fire resistance if

(*a*) it is constructed in accordance with the specifications given in the Ninth Schedule to these By-laws and the notional period of fire resistance given in that Schedule as being appropriate to that type of construction and other relevant factors is not less than the requisite fire resistance; or

(*b*) a similar part made to the same specification as the element is proved to have the requisite fire resistance under the conditions of test prescribed in the foregoing By-laws.

PART VIII
FIRE ALARMS, FIRE DETECTION, FIRE EXTINGUISHMENT AND FIRE FIGHTING ACCESS

225. Detecting and extinguishing fire.

(1) Every building shall be provided with means of detecting and extinguishing fire and with alarms together with illuminated exit signs in accordance with the requirements as specified in the Tenth Schedule to these By-laws.

(2) Every building shall be served by at least one fire hydrant located not more than 91.5 metres from the nearest point of fire brigade access.

(3) Depending on the size and location of the building and the provision of access for fire appliances, additional fire hydrant shall be provided as may be required by the Fire Authority.

226. Automatic System for hazardous occupancy.

Where hazardous processes, storage or occupancy are of such character as to require automatic sprinklers or other automatic extinguishing system, it shall be of a type and standard appropriate to extinguish fires in the hazardous materials stored or handled or for the safety of the occupants.

227. Portable extinguishers.

Portable extinguisher shall be provided in accordance with the relevant codes of practice and shall be sited in prominent positions on exit routes to be visible from all direction and similar extinguishers in a building shall be of the same method of operation.

228. Sprinkler valves.

(1) Sprinkler valves shall be located in a safe and enclosed position on the exterior wall and shall be readily accessible to the Fire Authority.

(2) All sprinkler systems shall be electricity connected to the nearest fire station to provide immediate and automatic relay of the alarm when activated.

229. Means of access and fire fighting in buildings over 18.3 metres high.

(1) Buildings in which the topmost floor is more than 18.3 metres above fire appliance access level shall be provided with means of gaining access and fighting fire from within the building consisting of fire fighting access lobbies, fire fighting staircase, fire lifts and dry or wet rising systems.

(2) Fire fighting access lobbies shall be provided at every floor level and shall be located that the level distance from the furthermost point of the floor does not exceed 45.75 metres.

(3) Fire fighting access lobbies may be omitted if the fire fighting staircase is pressurised to meet the requirements of by-law 200 and all fire fighting installations within the pressurised staircase enclosure do not intrude into the clear space required for means of egress.

(4) A fire fighting staircase shall be provided to give direct access to each fire fighting access lobby and shall be directly accessible from outside the building at fire appliance access level. This may be one of the staircases required as a means of egress from the building.

(5) A fire lift shall be provided to give access to each fire fighting access lobby or in the absence of a lobby to the fire fighting staircase at each floor level.

(6) The fire lift shall discharge directly into the fire fighting access lobby fire fighting staircase or shall be connected to it by a protected corridor.

230. Installation and testing of dry rising system.

(1) Dry rising systems shall be provided in every building in which the topmost floor is more than 18.3 metres but less than 30.5 metres above fire appliance access level.

(2) A hose connection shall be provided in each fire fighting access lobby.

(3) Dry risers shall be of minimum "Class C" pipes with fittings and connections of sufficient strength to withstand 21 bars water pressure.

(4) Dry risers shall be tested hydrostatically to withstand not less than 14 bars of pressure for two hours in the presence of the Fire Authority before acceptance.

(5) All horizontal runs of the dry rising systems shall be pitched at the rate of 6.35 millimetres in 3.05 metres.

(6) The dry riser shall be not less than 102 millimetres in diameter in buildings in which the highest outlet is 22.875 metres or less above the fire brigade pumping inlet and not less than 152.4 millimetres diameter where the highest outlet is higher than 22.875 metres above the pumping inlet.

(7) 102 millimetres diameter dry risers shall be equipped with a two-way pumping inlet and 152.4 millimetres dry risers shall be equipped with a four-way pumping inlet.

231. Installation and testing of wet rising system.

(1) Wet rising systems shall be provided in every building in which the topmost floor is more than 30.5 metres above fire appliance access level.

(2) A hose connection shall be provided in each fire fighting access lobby.

(3) Wet risers shall be of minimum 152.4 millimetres diameter and shall be hydrostatically tested at a pressure 50% above the working pressure required and not less than 14 bars for at least twenty-four hours.

(4) Each wet riser outlet shall comprise standard 63.5 millimetres instantaneous coupling fitted with a hose of not less than 38.1 millimetres diameter equipped with an approved typed cradle and a variable fog nozzle.

(5) A wet riser shall be provided in every staircase which extends from the ground floor level to the roof and shall be equipped with a three-way 63.5 millimetres outlet above the roof line.

(6) Each stage of the wet riser shall not exceed 61 metres, unless expressly permitted by D.G.F.S but in no case exceeding 70.15 metres.

232. Wet or dry rising system for buildings under construction.

(1) Where either wet or dry riser system is required, at least one riser shall be installed when the building under construction has reached a height of above the level of the fire brigade pumping inlet with connections thereto adjacent to a useable staircase.

(2) Such riser shall be extended as construction progresses to within two floors of the topmost floor under construction and where the designed height of the building requires the installation of a wet riser system fire pumps, water storage tanks and water main connections shall be provided to serve the riser.

233. Foam inlets.

Boiler rooms and storage areas below ground level where automatic extinguishing installation are not provided shall be equipped with foam inlets.

234. Underground structures and windowless buildings to have foam inlets.

All underground structures, windowless buildings depending on the type of occupancy, storage, processes or type of protection installed shall be provided with foam inlets as may be required by the Fire Authority.

235. Fixed Installations.

Fixed installations shall either be total flooding system or unit protection system depending upon the nature of hazard process and occupancy as may be required by the Fire Authority.

236. Special hazards.

Places constituting special hazards or risk due to the nature of storage, trade, occupancy or size shall be required to be protected by fixed installations, protective devices, systems and special extinguishers as may be required by the Fire Authority

237. Fire Alarms.

(1) Fire alarms shall be provided in accordance with the Tenth Schedule to these By-laws.

(2) All premises and buildings with gross floor area excluding car park and storage areas exceeding 9290 square metres or exceeding 30.5 metres in height shall be provided with a two-stage alarm system with evacuation (continuous signal) to be given immediately in the affected section of the premises while an alert (intermittent signal) be given in adjoining section.

(3) Provision shall be made for the general evacuation of the premises by action of a master control.

238. Command and control centre.

Every large premises or building exceeding 30.5 metres in height shall be provided with a command and control centre located on the designated floor and shall contain a panel to monitor the public address, fire brigade communication, sprinkler, water-flow detectors, fire detection and alarm systems and with a direct telephone connection to the appropriate fire station by-passing the switchboard.

239. Voice communication system.

There shall be two separate approved continuously electrically supervised voice communications systems, one a fire brigade communications system and the other a public address system between the central control station and the following areas:

(*a*) lifts, lift lobbies, corridors and staircases;

(*b*) in every office area exceeding 92.9 metres in area;

(*c*) in each dwelling unit and hotel guest room where the fire brigade system may be combined with the public address system.

240. Electrical isolation switch.

(1) Every floor or zone of any floor with a net area exceeding 929 square metres shall be provided with an electrical isolation switch located within a staircase enclosure to permit the disconnection of electrical power supply to the relevant floor or zone served.

(2) The switch shall be of a type similar to the fireman`s switch specified in the Institution of Electrical Engineers Regulations then in force.

241. Special requirements for fire alarm systems.

In places where there are deaf persons and in places where by nature of the occupancy audible alarm systems is undesirable, visible indicator alarm signals shall be incorporated in addition to the normal alarm system.

242. Fire fighting access lobbies.

Fire fighting access lobbies shall conform to the following requirements:

(*a*) each lobby shall have a floor area of not less than 5.57 square metres; and

(*b*) the openable area of windows or area of permanent ventilation shall be not less than 25% of the floor area of the lobby and, if ventilation is by means of openable windows, additional permanent ventilation having a free opening of 464 square centimetres shall be provided except that mechanical pressurization may be provided as an alternative.

243. Fire lift.

(1) In a building where the top occupied floor is over 18.5 metres above the fire appliance access level fire lifts shall be provided.

(2) A penthouse occupying not more than 50% of the area of the floor immediately below shall be exempted from this measurement.

(3) The fire lifts shall be located within a separate protected shaft if it opens into a separate lobby.

(4) Fire lifts shall be provided at the rate of one lift in every group of lifts which discharge into the same protected enclosure or smoke lobby containing the rising main, provided that the fire lifts are located not more than 61 metres travel distance from the furthermost point of the floor.

244. Standard required.

All fire fighting installations and appliances shall conform to the current edition of the following standards:

(*a*) Fire Hydrants	BS 750:1977 and BS CP 402.101; 1952
(*b*) Hydraulic Hose Reels	BS 5306 Part 1: 1976
(*c*) Portable Extinguishers	BS CP 402 Part 3: 1964
(*d*) Dry/Wet Rising Mains	BS 3980: 1966 BS 5306 Part 1: 1976 BS 750: 1964
(*e*) Foam Inlets	BS 3980: 1966
(*f*) Automatic Sprinklers	FOC Rules 29th Edition: 1973
(*g*) Fire Alarm Systems	FOC Rules: 1973 BS CP 1019: 1972 BS 3116 Part 1: 1970 BS 3116 Part 4: 1974 BS 5446 Part 1: 1977
(*h*) Fire Dampers	AS 1682: 1974
(i) Fire Lifts	BS 2655: Part 1: Appendix E

(j) Smoke Control AS 1668: Part 1: 1974

245. Approval of D.G.F.S.

(1) All fire fighting installations and appliance other than those conforming to the standards listed in by-law 244 shall be of those as tested and approved by the D.G.F.S.

(2) Plans, drawing and calculations of all fixed installations shall be submitted to the Fire Authority in a manner prescribed by the D.G.F.S before commencement of work.

(3) Every plan, drawing or calculation in respect of any automatic sprinklers or other fixed installations shall be submitted together with the relevant forms as prescribed in the Tenth Schedule to these By-laws.

246. Certification on completion.

When the fixed installation has been completed and final tests carried out the person submitting the plans shall certify to the Fire Authority on Form B as set out in the Tenth Schedule to these By-laws that the work has been completed and the necessary tests carried out in accordance with the current D.G.F.S. rules for various fixed installations

247. Water storage.

(1) Water storage capacity and water flow rate for the fire fighting systems and installations shall be provided in accordance with the scale as set out in the Tenth Schedule to these By-laws.

(2) Main water storage tanks within the building, other than for hose reel systems, shall be located at ground, first or second basement levels, with fire brigade pumping inlet connections accessible to fire appliances.

(3) Storage tanks for automatic sprinkler installations where full capacity is provided without need for replenishment shall be exempted from the restrictions in their location.

248. Markings on wet riser, etc.

(1) Wet riser, dry riser, sprinkler and other fire installation pipes and fittings shall be painted red.

(2) All cabinets and areas recessed in walls for location of fire installations and extinguishers shall be clearly identified to the satisfaction of the Fire Authority or otherwise clearly identified.

249. Smoke and heat venting.

In windowless buildings, underground structures and large area factories, smoke venting facilities shall be provided for the safe use of exit.

250. Natural draught smoke vent.

(1) Natural draught smoke venting shall utilise roof vents or vents in walls at near the ceiling level.

(2) Such vents shall normally be in open positions of if they are closed they shall be so designed to open automatically by an approved means in the event of a fire

251. Smoke vents to be adequate to prevent dangerous accumulation of smoke.

Where smoke venting facilities are installed for purposes of exit safety in accordance with the requirement of this Part they shall be adequate to prevent dangerous accumulation of smoke during the period of time necessary to evacuate the area served using available exit facilities with a margin of safety to allow for unforeseen contingencies

252. Smoke vents to be openable by fire Authority.

The discharge apertures of all manual smoke vents shall be so arranged as to be readily openable by the Fire Authority working from the exterior.

253. Emergency power system.

The discharge apertures of all manual smoke vents shall be so arranged as to be readily openable by the Fire Authority working from the exterior.

PART IX
MISCELLANEOUS

254. Buildings to which Part VII and VIII apply.

Buildings which on the date of commencement of these By-laws have been erected, or in the course of being erected or have not been erected but plans have been submitted and approved, and which according to by-law 134 fall within the classification of Place of assembly, Shop, Office, Other Residential and buildings exceeding 18.5 metres and buildings which are classified as hazardous or special risks shall be modified or altered to comply with Part VII and VIII of these By-laws within

(*a*) one year from the date of commencement of these By-laws in the case of buildings up to three storeys; and

(*b*) three years from the date of commencement of these By-laws in the case of buildings exceeding three storeys

255. Power of local authority to extend period, etc.

(1) Notwithstanding by-law 254 the local authority may where it is satisfied that it is justifiable to do so

(*a*) allow an extension or further extensions of the period within which the requirements under Parts VII and VIII of these By-laws are to be complied with; or

(*b*) allow variations, deviations or exemptions as it may specify from any provision of Part VII and VIII of these By-laws.

(2) Any person aggrieved by the decision of the local authority under paragraph (1) may within thirty days of the receipt of the decision appeal in writing to the Minister/State Authority, whose decision shall be final.

256. Buildings exempted.

Except for by-law 141 and paragraph (2) of by-law 225 the provisions under Part VII and VIII of these By-laws shall not apply to private dwelling houses, detached or semi-detached and terrace houses intended for single family occupancies

257. Malaysian standard Specification and Code of Practice to prevail over British Standard Specification and Code of Practice.

In these By-laws where there is any reference to the British Standard Specifications or British Code of Practice and there is, whether on the date of the coming into operation of these By-laws or subsequently, a corresponding Malaysian Standard Specification or Malaysian Code of Practice in respect of that subject, the Malaysian Standard Specification or Malaysian Code of Practice shall be deemed to have superseded the British Standard Specification or British Code of Practice respectively and shall be deemed to apply

258. Failure to Buildings.

(1) In the event of any failure to any building or part of the building, whether in the course of construction or after completion, the qualified person who

(*a*) submitted the plans, drawings or calculations for such building;

(*b*) supervised the setting out of such building;

(*c*) certified that the setting out was carried out in accordance with the approved site plan;

(*d*) supervised the construction of such building;

(*e*) certified that the proper supervision of such building as carried out;

shall within one week of the occurrence of such failure or such further period as may be specified by the local authority within whose jurisdiction such building is situated

(*aa*) report such failure;

(*bb*) explain the cause of failure; and

(*cc*) if such failure occurred during the construction of such building, state the remedial action taken.

(2) Such qualified person shall submit such further information in such manner and within such period as may be specified by the local authority.

(3) Where the local authority has reason to believe that a failure to any building or part of a building has occurred which failure has not been reported to such local authority it shall serve a notice on the qualified person who

(*a*) submitted the plans, drawings or calculations for such building;

(*b*) supervised the setting out of such building;

(*c*) certified that the setting out was carried out in accordance with the approved site plan;

(*d*) supervised the construction of such building;

(*e*) certified that proper supervision of such building was carried out;

requiring him within one week of such service to

(*aa*) state whether such failure occurred.

(*bb*) explain why he failed to report such failure;

(*cc*) if such failure occurred during the construction of such building, state the remedial action taken.

(4) Any qualified person who fails to comply with paragraph (1), (2) or (3) shall be guilty of an offence.

(5) Notwithstanding that any plan, drawing or calculation has been approved by the local authority, the responsibility for the failure of any building or part of a building shall prima facie lie with the person who submitted such plan, drawing or calculation.

(6) The qualified person as mentioned under paragraph (1) (a) of by-law 7 shall be subject to the same provision as specified under this by-law.

FIRST SCHEDULE

FEES FOR CONSIDERATION OF PLANS, PERMITS, ETC.

(By-law 3 (1) (a), 12 (1), 19 (2), 21 (2), 26 and 29)

Half the fees set out below shall be in respect of plans for buildings used exclusively for places of religious worship, schools or for charitable purpose.

1. New buildings

Fees for the consideration of plans submitted for approval in respect of new buildings shall be calculated as follows:

Ground Floor	$7.00 per every 9 square metres or part thereof subject to a minimum of $70.00
1st Floor	$6.00 per every 9 square metres or part thereof subject to a minimum of $60.00
2nd Floor	$5.00 for every 9 square metres or part thereof subject to a minimum of $50.00
3rd Floor	$4.00 for every 9 square metres or part thereof subject to a minimum of $40.00
4th Floor and above or basement storey (other than an open basement)	$3.00 for every 9 square metres or part thereof subject to a minimum of $30.00

2. Buildings approved on a temporary basis and tentative sketch plans.

In respect of plans of a building submitted for approval on a temporary year to year basis and tentative sketch plans submitted for approval in principle, one half of the fee specified in paragraph 1 shall be payable.

3. Sheds with open sides.

For plans submitted for approval of a shed type of building having all its sides open, one half of the feed specified in paragraph 1 shall be payable.

4. Open basements.

For plans submitted for approval of basement exceeding 2.5 metre in height which are open on all sides (exceeding where retaining walls occur) one half of the fees specified in paragraph 1 shall be payable.

5. Buildings of warehouse class.

For every building of the warehouse or godown class of which no part is intended for habitation (other than provision for a watchman) and which is not constructed in reinforced concrete or structural steel, one half of the fees specified in paragraph 1 shall be payable.

6. Alterations to existing buildings.

(1) For plans submitted for approval of alterations to existing buildings, one half of the fees specified in paragraph 1 shall be payable.

(2) If the alterations to an existing building are generally spread over the whole area of the building, then the fee payable shall be computed on the whole area of the building, but if a clear subdivision of

the building is not affected by the alteration scheme, such unaffected subdivision shall be excluded from the area on which the fee shall be computed.

(3) If a storey of any existing building is not affected by alteration to the building, such storey shall be excluded from the areas on which the fee payable for the alterations shall be computed.

(4) If alterations to an existing building involve an alteration to the frontage line or elevation to a street (where such elevation abuts a street) the following fees shall be paid on submission of plans for such alterations in addition to the fees payable under subparagraph (1), (2) and (3) of this paragraph:

(*a*) alterations to frontage line	$18.00 per storey
(*b*) alterations to street elevation	$18.00 per storey

(5) Where the alterations to an existing building involve only subdivision of rooms into smaller rooms, the fees payable on submission of plans for such alterations shall be $25.00 per smaller room or cubicle.

7. Wharves, bridges, etc.

For plans submitted for approval of wharves bridges, or other special buildings, the fee payable shall be $25.00 per 9 square metres or part thereof.

8. Retaining walls.

For plans submitted for approval of retaining walls, the fee payable shall be $3.00 per 9 square metres or part thereof, of its total elevation area measured from the top of the footings.

9. Series or rows of building.

For a series or row of buildings of the same plan and materials when plans are submitted for approval at the same time, a deduction of the fees specified in the preceding paragraph shall be made on the following basis:

first building	full fees
2nd to 5th building (inclusive)	90% of fees
6th to 10th building	85% of fees
11th to 25th building	75% of fees
26th and above building	60% of fees

10. Amendment plan to an approved plan.

(1) When an amendment plan to an approved plan is submitted for approval, a fee of $60.00 shall be payable for each such amendment plan.

(2) If an amendment to an approved plan involves additional area, then such additional area shall be charged on the basis set out in paragraph 1 in condition to the fee specified in subparagraph (1) of this paragraph.

(3) If the amendments to an approved plan are in the opinion of the local authority substantial, a fee equal to one half of the fee chargeable under paragraph 1 in respect of the approved plan shall be payable in addition to any fees payable under subparagraphs (1) and (2) of this paragraph.

11. Inspection of plans.

(1) An approved plan may be inspected in the office of the local authority subject to the payments of the prescribed fee.

(2) An approved plan may be copied in the office of the local authority subject to the applicant submitting with his application to copy such plan the written consent of the owner of the building.
(3) The fees payable shall be as follows:

(i) for inspecting an approved plan	$50.00 per set of plans
(ii) for copying an approved plan	$100.00 per set of plans

(4) The fee for an endorsement by the local authority to certify any copy as a true copy of an approved plan shall be $50.00 per copy.

12. Permits for minor works in lieu of plans.

Fee for permits issued under by-law 18 shall be payable as follows:

for minor erections, alterations and additions under paragraph (1) thereof and for erection of any fence under paragraph (2) thereof	$50.00 per permit

13. Temporary permits.

The following fees shall be payable for the temporary permits issued under by-law 19:

(a) shed for shows	$50.00
(b) place for worship	$20.00
(c) depositing building materials on streets with the consent of the local authority	$18.00 per sq. metre per month or part thereof
(d) builder`s working shed store or other shed in connection with new buildings	$100.00 per shed per 6 months or part thereof
(e) scaffolding erected on a street	$5.00 per scaffold pole per month or part thereof
(f) staging, framework, platform or temporary structure of any kind erected on a roof abutting a street	$50.00 per month or part thereof
(g) hording on streets or footways in connection with building works	$3.00 per metre of street of footway per month or part thereof
(h) any building for which a temporary permit has been issued under paragraph (2)	$5.00 per 9 square metres per annum with a minimum charge of $5.00 per permit being renewable on 1st January each year

14. Temporary Occupation permits.

Fee for issue of a temporary certificate of fitness for occupation under by-law 26 shall be charged at the rate of 10% of the fee prescribed in paragraph 1 of this Schedule based on the floor area to be occupied.

15. Refund of plan fees.

(1) One half of the fees paid on the submission plans shall be refunded on application when

(*a*) a plan is withdrawn before approval by the local authority within one year of submission; or

(*b*) a plan is not approved by the local authority; or

(*c*) notice of abandonment is received within one year after the date of approval of plan;

Provided that no fees will be refunded if the plans have been abandoned under section 70 (6) of the Act.

(2) Full fees shall be payable if a plan is re-submitted.

(3) The submission of plans under by-law 12 shall de deemed to be in continuation of the submission of the tentative sketch plans under that by-law and the fee paid on the submission of the tentative sketch plans shall be credited against the fees payable on the submission of the plans under that by-law subject to any adjustment in the computed areas:

Provided that where such plans are submitted no refund of fees shall be made whether such plans are approved or not.

16. Additional copy of notice or permit.

The fee for each additional copy of any notice, certificate or permit shall be $50.00.

17. Work commenced before approval of plans.

In all cases where work has been commenced before plans have been approved or a permit obtained a fee equal to ten times that specified in the relevant preceding paragraph may be charged. The payment of this enhanced fee will not exempt any person from being prosecuted by the local authority should it decide to do so.

SECOND SCHEDULE

UNIFORM BUILDINGS BY-LAWS 1984

FORM A

CERTIFICATION OF BUILDING/STRUCTURAL PLANS

(for endorsement on plans to be submitted for approval)

(By-law 3 (1) and 16 (2))

.....19.....

To the Local Authority,

.....

I certify that the details in the plans namely.....on Lot/s.....Section ..... Jalan ..... for.....are in accordance with the requirements of the Uniform Building By-laws 1984 and I accept full responsibility accordingly.

.....
Submitting Person

Name.....
Address.....
Registration No. .....
Class.....

FORM B

NOTICE OF COMMENCEMENT/RESUMPTION OF BUILDING OPERATIONS

(By-law 22(1) and (2))

.....19.....

To the Local Authority,
.....

I give notice that after the expiration of 4 days from the date of receipt of this notice I intend to commence/resume building operations namely:..... on Lot/s.....Section ..... Jalan ……..…… for.....in accordance with the Approved Plan No. .....
Dated.....

.....
Submitting Person

Name.....
Address.....
Registration No. .....
Class.....

FORM C

NOTICE OF COMPLETION OF SETTING OUT

(By-law 23)

.....19.....

To the Local Authority,
.....

I certify that the setting out of the building/s namely.....on Lot/s.....
Section .....Jalan.....for.....
has been carried out in accordance with--

**(a)* approved plans; or
(b) approved plans with amendments for which I undertake to submit amended plans for approval before the building is completed.

I accept full responsibility for ensuring that the amended sitting of the building will be in accordance with all the town planning and building requirements.

.....
Submitting Person

Name.....
Address.....
Registration No. .....
Class.....

* Delete which is inapplicable.

FORM D

NOTICE OF COMPLETION OF FOUNDATIONS

(By-law 24)

To the Local Authority,
.....
I give notice that the works on the foundations of the building/s namely.....on Lot/s.....
Section.....Jalan..... for.....have been completed in accordance with Approved Plan No.....
Dated.....
I certify and accept full responsibility that the soil conditions as exposed by the excavations are consistent with the design requirements and conform to the Uniform Building By-laws 1984.

.....
Submitting Person

Name.....
Address.....
Registration No. .....
Class.....

FORM E

APPLICATION FOR THE ISSUE OF CERTIFICATE OF FITNESS FOR OCCUPATION

(By-law 25 (1))

To the Local Authority,
.....

I/We give notice that the building/s namely…….....on Lot/s ..... Section ..... Jalan ……..... for ..... has/have been completed in accordance with Approved Plan No..... Dated..... and I/we apply for Certificate of Fitness for Occupation.

I/We certify and I/we have supervised the erection and completion of the building/s and that to the best of my/our knowledge and belief such work/s is/are in accordance with the Building and Structural Plans and that I/we accept full responsibility accordingly for those portions for those portions for which I/we am/are respectively concerned with.

.....
Submitting Person

Name.....
Address.....
Registration No. .....
Class.....

THIRD SCHEDULE

(By-law 41)

1. Interpretation.

In this Schedule, unless the context otherwise requires---

"air changes" means the hourly replacement of the volumetric content of air within an enclosure;

"cmm" means cubic metre of air per minute;

"enclosure" means room, ward, toilet, theatre, auditorium or any similarly enclosed space;

"foul air" means vitiated air and includes exhaust air from lavatories, bathrooms, urinals, toilets, kitchen, canteen, chemical stores, restaurant, hairdresser shops, laboratories, dark, room, battery rooms, car parks or similar areas, and air discharged from smoke extract system associated with fire protection services of buildings.

"fresh air" means normal outdoor air not unduly affected by odours, smoke, effluents, dust, vapours, fumes, discharged from mechanical plant and similar artificial influences which may affect the fresh air in any manner or from;

"fresh air changes" means air changes pen hour and shall constitute that proportion of the air change which is wholly fresh air;

"occupancy" means the number of persons occupying an enclosure, the average rate of which shall be the equivalent of one person occupying an enclosure for a continuous period of twenty minutes in any one hour.

2. Windowless rooms.

(1) Habitable rooms with no external walls and other enclosures shall be provided with mechanical ventilation or air-conditioning having a minimum fresh air change at the rate of 0.28 cmm per person, but in no case less than that specified in ASHARE Standard Code 62-73.

(2) Isolation wards and other such areas for infectious, contagious or other dangerous diseases shall be provided with mechanical ventilation or air-conditioning having a minimum fresh air change at the rate 0.42 cmm per person.

3. Filters for exhaust air.

(1) Filters for the removal of airborne bacteria shall be provided for all exhaust air discharge points to the requirements of the governing health authority.

(2) Exhaust air discharge points shall be at high or roof level and shall not in any case be lower than 5 metres from the external ground or pavement level.

4. Operating theatres.

(1) Operating theatres and anaesthetic rooms shall be dealt with boy combined input and extract systems to provide at least ten complete air changes per hour. It is essential that the relative quantities of input to extract air should be such that there is an outward movement of air from the operating theatre and anaesthetic room.

(2) The air inlets should be at high level with extraction points at low level. Recirculation arrangements should not be provided. The incoming air should be filtered and air-conditioned (the theatre temperature being capable of adjustment with mechanical requirements within the range 20^{0}C to

24.4^{0}C). Control over humidity of the air in the rooms should be provided to ensure that it will be within the range of 55% to 65%.

(3) Sterilizing rooms whether part of or separate from the operating theater should be dealt with in the similar manner to cater for the use of operating theater except that humidity control is not required. The extract should be at high level to ensure the removal of water vapour rising from the sterilizers.

(4) X-ray rooms and dark rooms should be provided with a minimum rate of ventilation of six complete air changes per hour and the temperature within the space should be maintained within the range of 20^{0}C to 24.4^{0}C. In addition a simple extract system will suffice.

(5) Air inlet points shall be not lower than two-thirds of the height of the room and exhaust air opening shall be within 1 metre of the finished floor level of the enclosure.

(6) Air shall not be re-circulated nor combined with any other air-conditioning or ventilation system and all air introduced into the enclosure shall be exhausted to the atmosphere without recirculation.

5. Openings for mechanical ventilation for air-conditioning systems.

Where mechanical ventilation or air conditioning is provided---

(a) foul air shall not be discharged into an air-well and this requirements shall not be applicable to window room units in residential applications;

(b) the underside of openings for the entry of air into any mechanical ventilation or air-conditioning plant shall be not less than 1 metre from any external pavement, road way, ground level or similar external surface;

(c) the underside of openings for the exhaust of air from any mechanical ventilation or air-conditioning plant shall be not less than 2.5 metres from any external pavement, road way, ground level or similar external surface;

(d) to any of the enclosures from which foul air will be exhausted, the ducts, trunking, service shafts or other such items containing or conveying the foul air from such enclosure shall in no way be connected to any air inlet system.

6. Filtration.

Unless otherwise specified, where air-conditioning is mentioned herein, it shall be deemed to include air filtration down to a particle size of ten microns with an efficiency of not less than 70% arrestance.

7. Mechanical ventilation system in basement areas.

(1) Basement and other enclosures ground level used for working areas or for occupancy of more than two hours duration shall be provided with mechanical ventilation having a minimum of six air changes per hour.

(2) Basement or underground car parks shall be provided with mechanical ventilation such that the air exhausted to the external atmosphere should constitute not less than six air changes per hour. Air extract opening shall be arranged such that it is not less than 0.5 metres above the floor level period system.

(3) Basement and other enclosures below ground level used for working areas or for occupancy of more than two hours' duration shall be provided with a minimum of one fresh air change per hour, or the minimum of 0.28 cmm per person working in such area.

8. Projection room.

Cinemas or other projection rooms where photographic film is being used, processed or stored, which are situated in the internal portion of the building, and in respect of which no such external walls (or those overlooking verandahs, pavement or walkways) are present, shall be provided with mechanical ventilation or air-conditioning, and all plant conveying extract or exhaust air shall not be combined in any way to other such plant serving the auditorium or any other parts of the premises.

9. Any other rooms.

Where rooms or enclosures in any building not specified in this Schedule are situated in the internal portions of the building and no such external walls (or those overlooking verandahs, pavement or walkways) are present, a minimum of one fresh air charge per hour shall be provided.

10. Water-closets and toilets.

Water closets, toilets, lavatories, bathrooms, latrines, urinals or similar rooms or enclosures used for ablutions which are situated in the internal portions of the building and in respect of which no such external walls (or those overlooking verandahs, pavement or walkways) are present, shall be provided with mechanical ventilation or air conditioning having a minimum of fresh air change at the rate of 0.61 cmm per square metre of floor area of ten air changes per hour, whichever is the lower.

11. Room, window, etc., air-conditioning units.

Where room, window or wall air-conditioning units are provided as means of air-conditioning, such units shall be capable of continuously introducing fresh air.

12. fresh air changes.

(1) The minimum scale of fresh air ventilation in conjunction with re-circulated, filtered and conditioned air meeting with the requirements of ASHARE STANDARD 62-73 shall be as follows:

Residential building	0.14 cmm per occupant
Commercial premises	0.14 cmm per occupant
Factory and Workshop	0.21 cmm per occupant
School classroom	0.14 cmm per occupant
Projection room	0.14 cmm per occupant
Theatre and Auditorium	0.14 cmm per set
Canteen	0.28 cmm per occupant
Building of Public Resort	0.28 cmm per occupant
Offices	0.14 cmm per occupant
Conference Room	0.28 cmm per occupant
Hospital wards	0.14 cmm per occupant
Computer Room	0.14 cmm per occupant
Hotel rooms	0.14 cmm per occupant

(2) The minimum scale of fresh air ventilation in conjunction with the mechanical ventilation systems shall be as follows:

NOTE---that all other areas shall be meet with the minimum requirements of the ASHARE STANDARD 62-73.

FOURTH SCHEDULE

WEIGHTS OF MATERIALS
(By-law 56)

	kN/m³	*kgf/m³*
Earth (in natural state or rammed)	17	1,734
Sand (wet)	20	2,039
Gravel	19	1,937
Aluminium Alloys	27	2,720
Steel	77	7,850
Brickwork	19	1,920
Concrete:		
(a) Unreinforced	23	2,310
(b) Reinforced	24	2,400
Granite and Marble	26	2,690
Limestone	25	2,500
Sandstone	23	2,310
Timber	8-11	800-1,120
	N/m²	*kfg/m²*
Plaster on brickwork, blocks or concrete per 25.4 mm thickness	480	49
Roof Tiles:		
(a) Terra-cotta (French pattern)	580	59
(b) Concrete	530	54
Glass per 6.35 mm thickness	170	17
Asbestos cement		
(a) 6.35 mm plain	160	16
(b) Corrugated	100-170	10-17
Galvanished Iron, 24 gauge, 76.2 mm corrugation	84	9
Brickwork per 25.4 mm thickness	480	49
Cement mortar finish per 25.4 mm thickness	580	59

USES AND LOADS

(By-law 59)

Use to which building or structure is to be put	*Intensity of distributed load*		*Concentrated load to be applied, unless otherwise stated, over any square with a 300 -- mm side*	
	kN/m²	*kgf/m²*	*kN*	*kgf*
ART GALLERY (See MUSEUM FLOORS) ASSEMBLY BUILDINGS such as public halls and theatres, but excluding drill halls places or worship, public lounges, schools and toilet rooms: with fixed seating* without fixed seating	4.0 5.0	408 510	- 3.6	- 367
BALCONIES	Same as the rooms to which they gave access		1.5 per metre run	153 per metre run
			concentrated at the edge	
BANKING HALLS	3.0	306	-	-
BEDROOMS: Domestic buildings Hotels and motels Institutional buildings	1.5 2.0 1.5	153 204 153	1.4 1.8 1.8	143 184 184
BILLIARD ROOMS	2.0	204	2.7	275
BOILER ROOMS	7.5	765	4.5+	459+
BOOK STORES	2.4 for each metre of storage height	245 for each metre of storage height	7.0+	714+
BROADCASTING STUDIOS: Corridors (see CORRIDORS)	2.0 4.5 kN per metre run	204 459 kgf per metre run	1.8 -	184 -
	uniformly distributed over the width			
Grids Stages Studios Toilet rooms	2.5 7.5 4.0 2.0	255 765 408 204	- 4.5 - -	- 459 - -
BUNGALOWS	1.5	153	1.4	143
CATWALKS	Concentrated loads only		1.0 at 1.0 m centres	102 at 1.0 m centres
CHAPELS ABD CHURCHES	3.0	306	2.7	275
CINEMAS (see ASSEMBLY BUILDINGS AND BROADCASTING STUDIOS CALSS ROOMS	3.0	306	2.7	275

CLUBS:	4.0	408	-	-
Assembly areas with fixed seating*	5.0	510	3.6	367
Assembly areas without fixed seating	1.5	153	1.8	184
Bedrooms	2.0	204	2.7	275
Billiard rooms				
Corridors (see CORRIDORS)	2.0	204	2.7	275
Dining rooms				
Kitchens	To be determined but not less than		4.5	459
	3.0	306		
Lounges	2.0	204	2.7	275
Laundries	3.0	306	4.5	459
Toilet rooms	2.0	204	-	-
COLD STORAGE	5.0 for each metre of storage height, with a minimum of 15.0	510 for each metre of storage height, with a minimum of 1530	9.0+	918+
COLLEGES:	4.0	408	-	-
Assembly areas with fixed seating*	5.0	510	3.6	367
Assembly area without fixed seating	1.5	153	1.8	184
Bedrooms	3.0	306	2.7	275
Class rooms				
Corridors (see CORRIDORS)	2.0	204	2.7	275
Dining rooms	1.5	153	1.8	184
Dormitories	5.0	510	3.6	367
Gymnasia				
Kitchens	To be determined but not less than			
	3.0	306	4.5	459
Laboratories, including equipment	To be determined but not less than		To be determined but not less than	
	3.0	306	4.5	459
Stages	5.0	510	3.6	367
Toilet rooms	2.0	204	-	-
CORRIDORS, HALLWAYS, PASSAGEWAYS, AISLES, PUBLIC SPACES AND FOOT-BRIDGES BETWEEN BUILDINGS: Buildings subject to crowd loading, except grandstands	4.0	408	4.5	459
Buildings subject to loads greater than from crowds, including wheeled vehicles, trolley, and the like	To be determined but not less than		To be determined but not less than	
	5.0	510	4.5	459
All other buildings	Same as the rooms to		which the give access	
DANCE HALLS	5.0	510	3.6	459
DEPARTMENTAL STORES:				

Shop floors for the display and sale of merchandise	4.0	408	3.6	367
DORMITORIES	1.5	153	1.8	184
DRILL ROOMS AND DRILL HALLS	5.0	510	To be determined but not less than	
			9.0	918
DRIVEWAY'S AND VEHICLE RAMPS	To be determined but not less than		To be determined but not less than	
other than in garages for the parking only of passengers vehicles and light vans not exceeding 2 500 kg gross weight	5.0	510	9.0	918
DWELLINGS	1.5	153	1.4	143
FACTORIES AND SIMILAR	5.0	510	4.5+	459+
BUILDINGS	7.5 or 10.0	765 or 1 020	6.7+ 9.0+	683+ 918+
	as appropriate			
FILE ROOMS IN OFFICES	5.0	510	4.5+	459+
FLATS	1.5	153	1.4	143
FOOTPHATS, TERRACES AND PLAZAS leading from ground level:	To be determined but not less than		To be determined but not less than	
No obstruction to vehicular traffic Used only for pedestrian traffic	5.0 4.0	510 408	9.0 4.5	918 459
FOUNDRIES	To be determined but not less than			
	20	2 040	-	-
GARAGES: Car parking only, for passenger vehicles and light vans nor exceeding 2 500 kg gross weight, including driveways and ramps.	2.5	255	9.0	918
All repair workshops for all types of vehicles and parking for vehicles exceeding 2 500 kg gross weight, including driveways and ramps	To be determined but not less than			
	5.0	510	9.0+	918+
GRANDSTANDS: Assembly areas with fixed seating* Assembly areas without mixed seating Corridors and passageways Toilet rooms	4.0 5.0 5.0 2.0	408 510 510 204	- 3.6 4.5 -	- 367 459 -
GYMNASIA	5.0	510	3.6	367
HALLS: Corridors, hallways and passageways (see CORRIDORS) Dressing rooms Fly galleries	2.0 4.5 kN per metre run	204 459 kgf per metre run	1.8	184
	uniformly distributed over the width			
Grids	2.5	255	-	-

Projection rooms	5.0	510	-	-
Stages	5.0	510	3.6	367
Toilet rooms	2.0	204	-	-
HOSPITALS:	2.0	204	1.8	184
Bedrooms and wards				
Corridors, hallways and passageways (see CORRIDORS)	2.0	204	2.7	275
Dining rooms	To be determined but not less than		4.5	459
Kitchens				
	3.0	306		
Laundries	3.0	306	4.5	459
Toilet rooms	2.0	204	-	-
Utility rooms	2.0	204	4.5	459
X-ray room and operating theatres	2.4	204	4.5	459
HOTELS AND MOTELS:	5.0	510	-	-
Bars and vestibules	2.0	204	1.8	194
Bedrooms				
Corridors, hallways and passageways (see CORRIDORS)	2.0	204	2.7	275
Dining rooms	To be determined but not less than		4.5	459
Kitchens				
	3.0	306		
Laundries	3.0	306	4.5	459
Lounges	2.0	204	2.7	275
Toilet rooms	2.0	204	-	-
HOUSES	1.5	153	1.4	143
INDOOR SPORTING FACILITIES:	To be determined but not less than			
Area for equipment				
	2.0	204	1.8+	183+
Assembly areas with fixed seating*	4.0	408	-	-
Assembly area without fixed seating	5.0	510	3.6	367
Corridors (see CORRIDORS)				
Dressing rooms	2.0	204	-	-
Gymnasia	5.0	510	3.6	367
Toilet rooms	2.0	204	-	-
INSTITUTIONAL BUILDINGS:	1.5	153	1.8	184
Bedrooms	To be determined but not less than			
Communal kitchens				
	3.0	306	4.5	459
Corridors, hallways and passageways (see CORRIDORS)				
Dining rooms	2.0	204	2.7	275
Dormitories	1.5	153	1.8	184
Laundries	3.0	306	4.5	459
Lounges	2.0	204	2.7	275
Toilet rooms	2.0	204	-	-
KITCHEN other than in domestic buildings, including normal equipment	To be determined but not less than		4.5	459
	3.0	306		
LABORATORIES, including equipment	To be determined but not less than			
	3.0	306	4.5	459

LANDINGS	Same as the floors to which they give access			
LAUNDRIES other than in domestic buildings, excluding equipment	To be determined but not less than			
	3.0	306	4.5	459
LIBRARIES:	2.5	255	4.5	459
Reading rooms without book storage				
Rooms with book storage	4.0	408	4.5	459
(e.g public lending libraries)	2.4	245	7.0+	714+
Stack rooms	for each metre of stack height with a minimum of	for each metre of stack height with a minimum of		
	6.5	663		
Dense mobile stacking on mobile trucks	4.8 for each metre of stack height with a minimum of	490 for each metre of stack height with a minimum of		
	9.6	980	7.0+	714+
Corridors	4.0	408	4.5	459
Toilet rooms	2.0	204	-	-
MACHINERY HALLS	4.0	408	4.5+	459+
Circulation spaces therein				
MAISONETTES	1.5	153	1.4	143
MOTOR ROOM, FAN ROOMS and the like, including weight of machinery	To be determined but not less than			
	7.5	765	4.5+	459+
MUSEUM FLOORS AND ART GALLERIES for exhibition	To be determined but not less than			
	4.0	408	4.5+	459+
OFFICES:	5.0	510	4.5+	459+
Corridors and public spaces (see CORIDORS)	2.5	255	2.7	275
Filing and storage spaces	3.5	357	4.5+	459+
Offices for general use	2.0	204	-	-
Offices with computing, data processing and similar equipment				
Toilet rooms				
PAVEMENT LIGHTS	To be determined but not less than		1? times the wheel load but not less than	
	5.0	510	9.0	918
PLACES OF WORSHIP	3.0	306	2.7	275
PRINTING PLANTS:	To be determined but not less than		9.0	918+
Paper storage				
	4.0 for each metre of storage	408 for each metre of storage		

	height	height		
Type storage and other areas	To be determined but not less than			
	12.5	1 275	9.0+	918+
PUBLIC HALLS (see HALLS)				
PUBLIC LOUNGES RESIDENTIAL BUILDINGS such an apartment houses, boarding houses, guest houses, hostels, lodging houses and residential clubs, but excluding hotels and motels: Bedrooms	2.0 1.5	204 153	2.7 1.8	275 184
Communal kitchens	To be determined but not less than			
	3.0	306	4.5	459
Corridors, hallways and passageways (see CORRIDORS) Dining rooms and public rooms Dormitories Laundries Toilet rooms	2.0 1.5 3.0 2.0	204 153 306 204	- 1.8 4.5 -	- 184 459 -
SCHOOLS (see COLLEGES)				
SHOP FLOORS for the display and sale of merchandise	4.0	408	3.6	367
STAIRS: Dwellings not over 3 storey All other buildings	1.5	153	1.8	184
	Same as the floors to which the give access, but not less than		Same as the floors to which the give access,	
	3.0	306		
	and not more than			
	5.0	510		
STATIONERY STORES	4.0 for each metre of storage height	408 for each metre of storage height	9.0+	918
STORAGE other than types listed separately	To be determined but not less than		7.0+	714+
	2.4 for each metre of storage height	245 for each metre of storage height		
TELEVISION STUDIOS (see BROADCASTING STUDIOS) THEATRES (see ASSEMBLY BUILDINGS AND BROADCASTING STUDIOS) UNIVERSITIES (see COLLEGES and LIBRARIES) WAREHOUSE (see STORAGE)	2.5	255	1.8	184

WORKROOMS, LIGHT, (without storage) WORKSHOPS (see FACTORIES)						

* Fixed seating implies that the removal of the seating and the use of the space for other purposes is improbable.

+ Concentrated load to be determined but not less value than these.

MINIMUM WIDTH OF STRIP FOUNDATIONS
(By-law 76,79)

(1) *Type of Subsoil*			*(2)* *Condition of subsoil*	*(3)* *Field Test Applicable*	*(4)* *Minimum width in millimetres for total load in kilo-newtons per lineal metre of load-bearing walling of not more than:*						
					20 kN/m	*30 kN/m*	*40 kN/m*	*50 kN/m*	*60 kN/m*	*70 kN/m*	
I	--	Rock	Not inferior to sandstone, limestone or firm chalk	Requires at least a pneumatic or other mechanically operated pick for excavation	*In each case equal to width of wall*						
II	--	Gravel Sand	Compact Compact	Requires pick for excavation. Wooden peg 50mm square in cross-section hard to drive beyond 150 mm	250	300	400	500	600	650	800
III	--	Clay Sandy clay	Stiff Stiff	Cannot be moulded with the fingers and requires a pick or pneumatic or other mechanically operated spade for its removal.	250	300	400	500	600	650	800
IV	--	Clay Sandy clay	Firm Firm	Can be moulded by substantial pressure with the fingers and can be excavated with graft or spade	250	300	400	500	600	650	800
V	--	Sand Slity sand Clayey sand	Loose Loose Loose	Can be excavated with a spade. Wooden peg 50 mm square in cross-section can be easily drive.	400	600	800	*NOTE: In relation to type V, VI and VII foundation do not fall within the provisions of by- law 80 of the total load exceeds 30 kN /m*			
VI	--	Silt Clay Sandy clay	Soft Soft Soft Soft	Fairly easily moulded with the fingers and readily excavated.	450	650	850				

		Silty clay						
VII	--	Silt Clay Sandy clay Silty clay	Very soft Very soft Very soft Very soft	Natural sample in winter conditions exudes between fingers when squeezed in fist	600	850		

FIFTH SCHEDULE

DESIGNATION OF PURPOSE GROUPS
(By-law 134, 138)

Number of purpose groups	*Descriptive Title*	*Purposes for which building or compartments is intended to be used*
I	Small residential	Private dwelling house detached or semidetached (not including a flat or terrace house) not comprising more than (1) a ground storey; (2) one upper storey or basement storeys
II	Institutional	Hospital, school or other similar establishment used as living accommodation for, or for treatment, care or maintenance of, persons suffering from disabilities due to illness or old age or other physical or mental disability or under the age of 5 years, where such persons sleep in the premises
III	Other residential	Accommodation for residential purpose other than any premises comprised in groups I and II
IV	Office	Office, or premises used for office purposes, meaning there by the purposes of administration, clerical work (including writing, book-keeping, sorting papers, filing, typing, duplicating, drawing and the editorial preparation of matter for publication), handling money and telephone and telegraph operating
V	Shop	Shop, or shop premises, meaning thereby premises not being a shop but used for the carrying on there of retail trade or business (including the sale to members of the public of food or drink for immediate consumption, retail sales by auction, the business of lending books or periodicals for the purpose of gain, and the business of a barber or hairdresser) and premises to which members of the public are invited to resort for the purpose of delivering their goods for repair or other treatment or of themselves carrying out repairs to or other treatment of goods
VI	Factory	Factory means all premises, as defined in section 2 of the Factories and Machinery Act 1967, but excluding those buildings classified under purpose group VIII--- Storage and general.
VII	Place of assembly	Place, whether public or private, used for the attendance of persons for or in connection with their social, recreational, educational, business or other activities, and not comprised within groups I to VI
VII	Storage and general	Place of storage, deposit or parking of goods and materials (including vehicles), and other premises not comprised in groups I to VII

DIMENSIONS OF BUILDINGS AND COMPARTMENTS

(By-law 136)

Purpose group (1)		*Height of buildings* (2)	*Limit of dimensions*	
			Floor are of storey in building or compartment (in m^2) (3)	*Cubic capacity of building or compartment (in m^3)* (4)
Part 1 --- Building other than single storey buildings				
II	(Institutional)	Any height	2 000	No limit
III	(Other residential)	Not exceeding 28 m	3 000	8 500
III	(Other residential)	Exceeding 28 m	2 000	5 500
V	(Shop)	Any height	2 000	7 000
VI	(Factory)	Not exceeding 28 m	No limit	28 000
VI	(Factory)	Exceeding 28 m	2 000	5 500
VIII	(Storage and general)	Not exceeding 28 m	No limit	21 000
VIII	(Storage and general)	Exceeding 28 m	1 000	No limit
Part 2 -- Single storey buildings				
II	(Institutional)	Any height	3 000	No limit
III	(Other residential)	Any height	3 000	No limit

NOTE: Purpose Groups I, IV, and VII are excluded as the are no limits applicable under by-law 138.

SIXTH SCHEDULE

CALCULATION OF PERMITTED LIMITS OF UNPROTECTED

AREAS

(By-law 142, 145)

PART I

GENERAL RULES

1. The permitted limit of unprotected areas in any side of a building or compartment shall be calculated by reference to the requirements of Part II, III or IV.

2. In calculating the size of unprotected areas or the permitted limit of unprotected areas, the following provisions shall apply:

(a) where any part of an external wall in an unprotected area, only because it has combustible material attached to it as cladding, the area of that unprotected area shall be deemed to be half the area of such cladding:

(b) no account shall be taken of any of the following:

(i) an unprotected area unless it is an area specified in subparagraph (iii) hereof, which does not exceed 0.1 square metre and which is not less than 1.5 metre from any other unprotected area in the same side of the building or compartment;

(ii) one or more unprotected areas having an area, or if more than one, an aggregate area not exceeding 1 square metre and not less than 4 metres from any other unprotected area in the same side of the building or compartment, except and such area as is specified in subparagraph (i) above;

(iii) an unprotected area in any part of an external wall which forms part of a protected shaft;

(iv) an unprotected are in the side of a building not divided into compartments, if the area is not less than 28 metres above any ground adjoining that side of the building.

PART II

RULES FOR CALCULATION BY REFERENCE TO AN
ENCLOSING RECTANGLE

1. The conditions of this Part shall be satisfied if a building or compartment is so situated that no point on the relevant boundary is either between the relevant plane of reference and the side of the building or compartment or at a distance from the relevant plane of reference which is less than the distance specified in the Tables to this Part, according to the purpose group of the building or compartment, the dimensions of the enclosing rectangle and the unprotected percentage.

2. For the purpose of this Part---

"plane of reference" means any vertical plane which touches the side of some part o the side of a building or compartment, but which (however far extended) does not pass within the structure of such

building or compartment (and for this purpose, any balcony, coping or similar projection shall be deemed not to be part either of the side or of the structure; and the relevant plane of reference shall in each case taken as the most favourable in that respect to the person erecting the building;

"enclosing rectangle" means the smallest rectangle on the relevant plane of reference which would---

(a) enclose all the outer edges of any unprotected areas of the building or, if the building is divided into compartments, of the compartments(other than any part of unprotected area which is at angle of more than 80^0 to the plane of reference), the other edges being for this purpose projected on the plane of reference by lines perpendicular to such plane; and

(b) have the horizontal sides; and

(c) have height and width falling within those listed in the Tables to this Part;

"unprotected percentage" means the percentage of the area of the enclosing rectangle which is equal to the aggregate of the unprotected areas taken into account in calculating the enclosing rectangle and as projected on it.

TABLES TO PART II

TABLE I---BUILDING OR COMPARTMENTS OF PURPOSE GROUPS

I (Small Residential), II (Institutional), III (Other Residential),
IV (Office) and VII (Assembly)

Width of enclosing rectangle in metres	*Distance in metres from relevant boundary for unprotected percentage not exceeding*								
	20	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*
Enclosing rectangle 3 m high									
3	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0
6	1.0	1.0	1.5	2.0	2.0	2.0	2.5	2.5	3.0
9	1.0	1.0	1.5	2.0	2.5	2.5	3.0	3.0	3.5
12	1.0	1.5	2.0	2.0	2.5	3.0	3.0	3.5	3.5
15	1.0	1.5	2.0	2.5	2.5	3.0	3.5	3.5	4.0
18	1.0	1.5	2.0	2.5	2.5	3.0	3.5	4.0	4.0
21	1.0	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.5
24	1.0	1.5	2.0	2.5	3.0	3.5	3.5	4.0	4.5
27	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5
30	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5
40	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	5.0
No limit	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	5.0
Enclosing rectangle 6 m high									
3	1.0	1.0	1.5	2.0	2.0	2.0	2.5	2.5	3.0
6	1.0	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.0
9	1.0	2.0	2.5	3.0	3.5	4.0	4.5	4.5	5.0

12	1.5	2.5	3.0	3.5	4.0	4.5	5.0	5.0	5.5
15	1.5	2.5	3.0	4.0	4.5	5.0	5.5	5.5	6.0
18	1.5	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.5
21	1.5	2.5	3.5	4.0	5.0	5.5	6.0	6.5	7.0
24	1.5	2.5	3.5	4.5	5.0	5.5	6.0	7.0	7.0
27	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5
30	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	8.0
40	1.5	2.5	3.5	4.5	5.6	6.5	7.0	8.0	8.5
50	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.0	9.0
60	1.5	2.5	3.5	5.0	5.5	6.5	7.5	8.5	9.5
80	1.5	2.5	3.5	5.0	6.0	7.0	7.5	8.5	9.5
100	1.5	2.5	3.5	5.0	6.0	7.0	8.0	8.5	10.0
No limit	1.5	2.5	3.5	5.0	6.0	7.0	8.0	8.5	10.0
Enclosing rectangle 9 m high									
3	1.0	1.0	1.5	2.0	2.5	2.5	3.0	3.0	3.5
6	1.0	2.0	2.5	3.0	3.5	4.0	4.5	4.5	5.0
9	1.5	2.5	3.5	4.0	4.5	5.0	5.5	5.5	6.0
12	1.5	3.0	3.5	4.5	5.0	5.5	6.0	605	7.0
15	2.0	3.0	4.0	5.0	5.5	6.0	6.5	7.0	7.5
18	2.0	3.5	4.5	5.0	6.0	6.5	7.0	8.0	8.5
21	2.0	3.5	4.5	5.5	6.5	7.0	7.5	8.5	9.0
24	2.0	3.5	5.0	5.5	6.5	7.5	8.0	9.0	9.5
27	2.0	3.5	5.0	6.0	7.0	7.5	8.5	9.5	10.0
30	2.0	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.5
40	2.0	3.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5
50	2.0	4.0	5.5	6.5	8.0	9.0	10.0	11.5	12.5
60	2.0	4.0	5.5	7.0	8.0	9.5	11.0	11.5	13.0
80	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	13.5
100	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	14.5
120	2.0	4.0	5.5	7.0	8.5	10.0	11.5	12.5	14.5
No Limit	2.0	4.0	5.5	7.0	8.5	10.5	12.0	12.5	15.0
Enclosing rectangle 12 m high									
3	1.0	1.5	2.0	2.0	2.5	3.0	3.0	3.5	3.5
6	1.5	2.5	3.0	3.5	4.0	4.5	5.0	5.0	5.5
9	1.5	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
12	1.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5	8.0
15	2.0	3.5	5.0	5.5	6.5	7.0	8.0	8.5	9.0
18	2.5	4.0	5.0	6.0	7.0	7.5	8.5	9.0	10.0
21	2.5	4.0	5.5	6.5	7.5	8.5	9.0	10.0	10.5
24	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.5
27	2.5	4.5	6.0	7.0	8.0	9.0	10.5	11.0	12.0
30	2.5	4.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
40	2.5	5.0	6.5	8.0	9.5	10.5	12.0	13.0	14.0

50	2.5	5.0	7.0	8.5	10.0	11.0	13.0	14.0	15.0
60	2.5	5.0	7.0	9.0	10.5	12.0	13.5	14.5	16.0
80	2.5	5.0	7.0	9.0	11.0	13.0	14.5	16.0	17.0
100	2.5	5.0	7.5	9.5	11.5	13.5	15.0	16.5	18.0
120	2.5	5.0	7.5	9.5	11.5	13.5	15.0	17.0	18.5
No Limit	2.5	5.0	7.5	9.5	12.0	14.0	15.5	17.0	19.0
Enclosing rectangle 15 m high									
3	1.0	1.5	2.0	2.5	2.5	3.0	3.5	3.5	4.0
6	1.5	2.5	3.0	4.0	4.5	5.0	5.5	5.5	6.0
9	2.0	3.0	4.0	5.0	5.5	6.0	6.5	7.0	7.5
12	2.0	3.5	5.0	5.5	6.5	7.0	8.0	8.5	9.0
15	2.0	4.0	5.5	6.5	7.0	8.0	9.0	9.5	10.0
18	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.0
21	2.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0
24	3.0	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0
27	3.0	5.5	7.0	8.5	9.5	10.5	11.5	12.5	13.5
30	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.5	14.0
40	3.0	6.0	8.0	9.5	11.0	12.5	13.5	15.0	16.0
50	3.5	6.0	8.5	10.0	12.0	13.5	15.0	16.5	17.5
60	3.5	6.5	8.5	10.5	12.5	14.0	15.5	17.0	18.0
80	3.5	6.5	9.0	11.0	13.5	15.0	17.0	18.5	20.0
100	3.5	6.5	9.0	11.5	14.0	16.0	18.0	19.5	21.5
120	3.5	6.5	9.0	11.5	14.0	16.5	18.5	20.5	22.5
No Limit	3.5	6.5	9.0	12.0	14.5	17.0	19.0	21.0	23.0
Enclosing rectangle 18 m high									
3	1.0	1.5	2.0	2.5	2.5	3.0	3.5	4.0	4.0
6	1.5	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.5
9	2.0	3.5	4.5	5.0	6.0	6.5	7.0	8.0	8.5
12	2.5	4.0	5.0	6.0	7.0	7.5	8.5	9.0	10.0
15	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.0
18	2.5	5.0	6.5	7.5	8.5	9.5	11.0	11.5	13.0
21	3.0	5.5	7.0	8.0	9.5	10.5	11.5	12.5	13.0
24	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.0	14.0
27	3.5	6.0	8.0	9.0	10.5	11.5	12.5	13.5	14.5
30	3.5	6.5	8.0	9.5	11.0	12.0	13.5	14.5	15.5
40	4.0	7.0	9.0	11.0	12.0	13.5	15.0	16.5	17.5
50	4.0	7.0	9.5	11.5	13.0	15.0	16.5	18.0	19.0
60	4.0	7.5	10.0	12.0	14.0	16.0	17.5	19.5	20.5
80	4.0	7.5	10.0	13.0	15.0	17.0	19.0	21.0	22.5
100	4.0	7.5	10.0	13.5	16.0	18.0	20.5	22.5	24.0
120	4.0	7.5	10.0	14.0	16.5	19.0	21.0	23.5	25.5
No Limit	4.0	8.0	10.0	14.0	17.0	19.5	22.0	24.0	26.5
Enclosing rectangle 21 m high									

3	0.5	1.5	2.0	2.5	3.0	3.0	3.5	4.0	4.5
6	1.5	2.5	3.5	4.0	5.0	5.5	6.0	6.5	7.0
9	2.0	3.5	4.5	5.5	6.5	7.0	7.5	8.5	9.0
12	2.5	4.0	5.5	6.5	7.5	8.5	9.0	10.0	10.5
15	2.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0
18	3.0	5.5	7.0	8.0	9.5	10.5	11.5	12.5	13.0
21	3.0	6.0	7.5	9.0	10.0	11.0	12.5	13.5	14.0
24	3.5	6.0	8.0	9.5	10.5	12.0	13.0	14.0	15.0
27	3.5	6.5	8.5	10.0	11.5	13.0	14.0	15.0	16.0
30	4.0	7.0	9.0	10.5	12.0	13.0	14.5	16.0	16.5
40	4.5	7.5	10.0	12.0	13.5	15.0	16.5	18.0	19.0
50	4.5	8.0	11.0	13.0	14.5	16.5	18.0	20.0	21.0
60	4.5	8.5	11.5	13.5	15.5	17.5	19.5	21.0	22.5
80	4.5	8.5	12.0	14.5	17.0	19.0	21.0	23.5	25.0
100	4.5	9.0	12.0	15.5	18.0	20.5	22.5	25.0	27.0
120	4.5	9.0	12.0	16.0	18.5	21.5	23.5	26.5	28.5
No Limit	4.5	9.0	12.0	16.0	19.0	22.0	25.0	26.5	29.5
Enclosing rectangle 24 m high									
3	0.5	1.5	2.0	2.5	3.0	3.5	3.5	4.0	4.5
6	1.5	2.5	3.5	4.5	5.0	5.5	6.0	7.0	7.0
9	2.0	3.5	5.0	5.5	6.5	7.5	8.0	9.0	9.5
12	2.5	4.5	6.0	7.0	8.0	8.5	9.5	10.5	11.5
15	3.0	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0
18	3.0	5.5	7.5	8.5	10.0	11.0	12.0	13.0	14.0
21	3.5	6.0	8.0	9.5	10.5	12.0	13.0	14.0	15.0
24	3.5	6.5	8.5	10.0	11.5	12.5	14.0	15.0	16.0
27	4.0	7.0	9.0	11.0	12.5	13.5	15.0	16.0	17.0
30	4.0	7.5	9.5	11.5	13.0	14.0	15.5	17.0	18.0
40	4.5	8.5	11.0	13.0	14.5	16.0	18.0	19.0	20.5
50	5.0	9.0	12.0	14.0	16.0	17.5	19.5	21.0	22.5
60	5.0	9.5	12.5	15.0	17.0	19.0	21.0	23.0	24.5
80	5.0	10.0	13.5	16.5	18.5	21.0	23.5	25.5	27.5
100	5.0	10.0	13.5	17.0	20.0	22.5	25.0	27.5	29.5
120	5.5	10.0	13.5	17.5	20.5	23.5	26.5	29.0	31.0
No Limit	5.5	10.0	13.5	18.0	21.0	24.0	27.5	30.0	32.5
Enclosing rectangle 27 m high									
3	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.0	4.5
6	1.5	2.5	3.5	4.5	5.0	6.0	6.5	7.0	7.5
9	2.0	3.5	5.0	6.0	7.0	7.5	8.5	9.5	10.0
12	2.5	4.5	6.0	7.0	8.0	9.0	10.5	11.0	12.0
15	3.0	5.5	7.0	8.5	9.5	10.5	11.5	12.5	13.5
18	3.5	6.0	8.0	9.0	10.5	11.5	12.5	13.5	14.5
21	3.5	6.5	8.5	10.0	11.5	13.0	14.0	15.0	16.0

24	3.5	7.0	9.0	11.0	12.5	13.5	15.0	16.0	17.0
27	4.0	7.5	10.0	11.5	13.0	14.0	16.0	17.0	18.0
30	4.0	8.0	10.0	12.0	13.5	15.0	17.0	18.0	19.0
40	5.0	9.0	11.5	13.0	15.5	17.5	19.0	20.5	22.0
50	5.5	9.5	12.5	15.0	17.0	19.0	21.0	22.5	24.0
60	6.0	10.5	13.5	16.0	18.5	20.5	22.5	24.5	26.5
80	6.0	11.0	14.5	17.5	20.5	22.5	25.0	27.5	29.5
100	6.0	11.0	15.5	19.0	21.5	24.5	27.0	30.0	35.0
120	6.0	11.5	15.5	19.5	22.5	26.0	28.5	32.0	34.0
No Limit	6.0	11.5	15.5	20.0	23.5	27.0	29.5	33.0	35.0

TABLE II---BUILDING OR COMPARTMENTS OF PURPOSE GROUPS

V (shop), VI (Factory) and VIII (Storage and General)

Width of enclosing rectangle in metres	*Distance in metres from relevant boundary for unprotected percentage not exceeding*								
	20	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*
Enclosing rectangle 3 m high									
3	1.0	1.5	2.0	2.0	2.5	2.5	2.5	3.0	3.0
6	1.5	2.0	3.0	3.0	3.5	3.5	4.0	4.0	4.0
9	1.5	2.5	3.0	3.5	4.0	4.0	4.5	5.0	5.0
12	2.0	2.5	3.5	3.5	4.0	4.5	5.0	5.5	5.5
15	2.0	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.0
18	2.0	2.5	3.5	4.0	5.0	5.0	6.0	6.5	6.5
21	2.0	3.0	4.0	4.5	5.0	5.5	6.0	6.5	7.0
24	2.0	3.0	4.0	4.5	5.0	5.5	6.0	7.0	7.5
27	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.0	7.5
30	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.5	8.0
40	2.0	3.0	4.0	5.0	5.5	6.5	7.0	8.0	8.5
50	2.0	3.0	4.0	5.0	6.0	6.5	7.5	8.0	9.0
60	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.5	9.5
80	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	9.5
No limit	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Enclosing rectangle 6 m high									
3	1.5	2.0	2.5	3.0	3.0	3.5	3.5	4.0	4.0
6	2.0	3.0	3.5	4.0	4.5	5.0	5.5	5.5	6.0
9	2.5	3.5	4.5	5.0	5.5	6.0	6.5	7.0	7.0
12	3.0	4.0	5.0	5.5	6.5	7.0	7.5	8.0	8.5
15	3.0	4.5	5.5	6.0	7.0	7.5	8.0	9.0	9.0
18	3.5	4.5	5.5	6.5	7.5	8.0	9.0	9.5	10.0

21	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.0	10.5
24	3.5	5.0	6.0	7.0	8.5	9.5	10.0	10.5	11.0
27	3.5	5.0	6.5	7.5	8.5	9.5	20.5	11.0	12.0
30	3.5	5.0	6.5	8.0	9.0	10.0	11.0	12.0	12.5
40	3.5	5.5	7.0	8.5	10.0	11.0	12.0	13.0	14.0
50	3.5	5.5	7.5	9.0	10.5	11.5	13.0	14.0	15.0
60	3.5	5.5	7.5	9.5	11.0	12.0	13.5	15.0	16.0
80	3.5	6.0	7.5	9.5	11.5	13.0	14.5	16.0	17.5
100	3.5	6.0	8.0	10.0	12.0	13.5	15.0	16.5	18.0
120	3.5	6.0	8.0	10.0	12.0	14.0	15.5	17.0	19.0
No Limit	3.5	6.0	8.0	10.0	12.0	14.0	16.0	18.0	19.0
Enclosing rectangle 9 m high									
3	1.5	2.5	3.0	3.5	4.0	4.0	4.5	5.0	5.0
6	2.5	3.5	4.5	5.0	5.5	6.0	6.5	7.0	7.0
9	3.5	4.5	5.5	6.0	6.5	7.5	8.0	8.5	9.0
12	4.0	5.0	6.0	7.0	7.5	8.5	9.0	9.5	10.5
15	4.5	5.5	6.5	7.5	8.5	9.5	10.0	11.0	11.5
18	4.5	6.0	7.0	8.5	9.5	10.0	11.0	12.0	12.5
21	5.0	6.5	7.5	9.0	10.0	11.0	12.0	13.0	13.5
24	5.0	6.5	8.0	9.5	11.0	12.0	13.0	13.5	14.5
27	5.0	7.0	8.5	10.0	11.5	12.5	13.5	14.5	15.0
30	5.5	7.0	9.0	10.5	12.0	13.0	14.0	15.0	16.0
40	5.5	7.5	9.5	11.5	13.0	14.5	15.5	17.0	17.5
50	5.5	8.0	10.0	12.5	14.0	15.5	17.0	18.5	19.5
60	5.5	8.0	11.0	13.0	15.0	16.5	18.0	19.5	21.0
80	5.5	8.5	11.5	13.5	16.0	17.5	19.5	21.5	23.0
100	5.5	8.5	11.5	14.5	16.5	18.5	21.0	22.5	24.5
120	5.5	8.5	11.5	14.5	17.0	19.5	21.5	23.5	26.0
No Limit	5.5	8.5	11.5	15.0	17.5	20.0	22.5	24.5	27.0
Enclosing rectangle 12 m high									
3	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	5.5
6	3.0	4.0	5.0	5.5	6.5	7.0	7.5	8.0	8.5
9	3.5	5.0	6.0	7.0	7.5	8.5	9.0	9.5	10.5
12	4.5	6.0	7.0	8.0	9.0	9.5	11.0	11.5	12.0
15	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0	13.5
18	5.0	7.0	8.5	10.0	11.0	12.0	13.0	14.0	14.5
21	5.5	7.5	9.0	10.5	12.0	13.0	14.0	15.0	16.0
24	6.0	8.0	9.5	11.5	12.5	14.0	15.0	16.0	16.5
27	6.0	8.0	10.5	12.0	13.5	14.5	16.0	17.0	17.5
30	6.5	8.5	10.5	12.5	14.0	15.0	16.5	17.5	18.5
40	6.5	9.5	12.0	14.0	15.5	17.5	18.5	20.0	21.0
50	7.0	10.0	13.0	15.0	17.0	19.0	20.5	23.0	23.0
60	7.0	10.5	13.5	16.0	18.0	20.0	21.5	23.5	25.0

80	7.0	11.0	14.5	17.0	19.5	21.5	23.5	26.0	27.5
100	7.5	11.5	15.0	18.0	21.0	23.0	25.5	28.0	30.0
120	7.5	11.5	15.0	18.5	22.0	24.0	27.0	29.5	31.5
No Limit	7.5	12.0	15.5	19.0	22.5	25.0	28.0	30.5	34.0
Enclosing rectangle 15 m high									
3	2.0	2.5	3.5	4.0	4.5	5.0	5.5	6.0	6.0
6	3.0	4.5	5.5	6.0	7.0	7.5	8.0	9.0	9.0
9	4.0	5.5	6.5	7.5	8.5	9.5	10.0	11.0	11.5
12	5.0	6.5	8.0	9.0	10.0	11.0	12.0	13.0	13.5
15	5.5	7.0	9.0	10.0	11.5	12.5	13.5	14.5	15.0
18	6.0	8.0	9.5	11.0	12.5	13.5	14.5	15.5	16.5
21	6.5	8.5	10.5	12.0	13.5	14.5	16.0	16.5	17.5
24	6.5	9.0	11.0	13.0	14.5	15.5	17.0	18.0	19.0
27	7.0	9.5	11.5	13.5	15.0	16.5	18.0	19.0	20.0
30	7.5	10.0	12.0	14.0	16.0	17.0	18.5	20.0	21.0
40	8.0	11.0	13.5	16.0	18.0	19.5	21.0	22.5	23.5
50	8.5	12.0	15.0	17.5	19.5	21.5	23.0	25.0	26.0
60	8.5	12.5	15.5	18.0	21.0	23.5	25.0	27.0	28.0
80	9.0	13.5	17.0	20.0	23.0	25.5	28.0	30.0	31.5
100	9.0	14.0	18.0	21.5	24.5	27.5	30.0	32.5	34.5
120	9.0	14.0	18.5	22.5	25.5	28.5	31.5	34.5	37.0
No Limit	9.0	14.5	19.0	23.0	27.0	30.0	34.0	36.0	39.0
Enclosing rectangle 18 m high									
3	2.0	2.5	3.5	4.0	5.0	5.0	6.0	6.5	6.5
6	3.5	4.5	5.5	6.5	7.5	8.0	9.0	9.5	10.0
9	4.5	6.0	7.0	8.5	9.5	10.0	11.0	12.0	12.5
12	5.0	7.0	8.5	10.0	11.0	12.0	13.0	14.0	14.5
15	6.0	8.0	9.5	11.0	12.5	13.5	14.5	15.5	16.5
18	6.5	8.5	11.0	12.0	13.5	14.5	16.0	17.0	18.0
21	7.0	9.5	11.5	13.0	14.5	16.0	17.0	18.0	19.5
24	7.5	10.0	12.0	14.0	15.5	16.5	18.5	19.5	20.5
27	8.0	10.5	12.5	14.5	16.5	17.5	19.5	20.5	21.5
30	8.0	11.0	13.5	15.5	17.0	18.5	20.5	21.5	22.5
40	9.0	12.0	15.0	17.5	19.5	21.5	23.5	25.0	26.0
50	9.5	13.0	16.5	19.0	21.5	23.5	26.0	27.5	29.0
60	10.0	14.0	17.5	20.5	23.0	26.0	27.5	29.5	31.0
80	10.0	15.0	19.0	22.5	26.0	28.5	31.0	33.5	35.0
100	10.0	16.0	20.5	24.0	28.0	31.0	33.5	36.0	38.5
120	10.0	16.5	21.0	25.5	29.5	32.5	35.5	39.0	41.5
No Limit	10.0	17.0	21.0	26.5	30.5	34.0	37.0	41.0	43.5
Enclosing rectangle 21 m high									
3	2.0	3.0	3.5	4.5	5.0	5.5	6.0	6.5	7.0
6	3.5	5.0	6.0	7.0	8.0	9.0	9.5	10.0	10.5

9	4.5	6.5	7.5	9.0	10.0	11.0	12.0	13.0	13.5
12	5.5	7.5	9.0	10.5	12.0	13.0	14.0	15.0	16.0
15	6.5	8.5	10.5	12.0	13.5	14.5	16.0	16.5	17.5
18	7.0	9.5	11.5	13.0	14.5	16.0	17.0	18.0	19.5
21	7.5	10.0	12.5	14.0	15.5	17.0	18.5	20.0	21.0
24	8.0	10.5	13.0	15.0	16.5	18.0	20.0	21.0	22.0
27	8.5	11.5	14.0	16.0	18.0	19.0	21.0	22.5	23.5
30	9.0	12.0	14.5	16.5	18.5	20.5	22.0	23.5	25.0
40	10.0	13.5	16.5	19.0	21.5	23.0	25.5	27.0	28.5
50	11.0	14.5	18.0	21.0	23.5	25.5	28.0	30.0	31.5
60	11.5	15.5	19.5	22.5	25.5	28.0	30.5	32.5	33.5
80	12.0	17.0	21.0	25.0	28.5	31.5	34.0	36.5	38.5
100	12.0	18.0	22.5	27.0	31.0	34.5	37.0	40.0	42.0
120	12.0	18.5	23.5	28.5	32.5	36.5	39.5	43.0	45.5
No Limit	12.0	19.0	25.0	29.5	34.5	38.0	41.5	45.5	48.0
Enclosing rectangle 24 m high									
3	2.0	3.0	3.5	4.5	5.0	5.5	6.0	7.0	7.5
6	3.5	5.0	6.0	7.0	8.5	9.5	10.0	10.5	11.0
9	5.0	6.5	8.0	9.5	11.0	12.0	13.0	13.5	14.5
12	6.0	8.0	9.5	11.5	12.5	14.0	15.0	16.0	16.5
15	6.5	9.0	11.0	13.0	14.5	15.5	17.0	18.0	19.0
18	7.5	10.0	12.0	14.0	15.5	16.5	18.5	19.5	20.5
21	8.0	10.5	13.0	15.0	16.5	18.0	20.0	21.0	22.0
24	8.5	11.5	14.0	16.0	18.0	19.5	21.0	22.5	24.0
27	9.0	12.5	15.0	17.0	19.0	20.5	22.5	24.0	25.5
30	9.5	13.0	15.5	18.0	20.0	21.5	23.5	25.0	26.5
40	11.0	14.5	18.0	20.5	23.0	25.0	27.5	29.0	30.5
50	12.0	16.0	19.5	22.5	25.5	27.5	30.0	32.0	33.5
60	12.5	17.0	21.0	24.5	27.5	30.0	32.5	35.0	36.5
80	13.5	18.5	23.5	27.5	31.0	34.5	37.0	39.5	41.5
100	13.5	20.0	25.0	29.5	33.5	37.0	40.0	43.0	45.5
120	13.5	20.5	26.5	31.0	36.0	39.5	43.0	46.5	49.0
No Limit	13.5	21.0	27.5	32.5	37.5	42.0	45.5	49.5	52.0
Enclosing rectangle 27 m high									
3	2.0	3.0	4.0	4.5	5.5	6.0	6.5	7.0	7.5
6	3.5	5.0	6.5	7.5	8.5	9.5	10.5	11.0	12.0
9	5.0	7.0	8.5	10.0	11.5	12.5	13.5	14.5	15.0
12	6.0	8.0	10.5	12.0	13.5	14.5	16.0	17.0	17.5
15	7.0	9.5	11.5	13.5	15.0	16.5	18.0	19.0	20.0
18	8.0	10.5	12.5	14.5	16.5	17.5	19.5	20.5	21.5
21	8.5	11.5	14.0	16.0	18.0	19.0	21.0	22.5	23.5
24	9.0	12.5	15.0	17.0	19.0	20.5	22.5	24.0	25.5
27	10.0	13.0	16.0	18.0	20.0	22.0	24.0	25.5	27.0

30	10.0	13.5	17.0	19.0	21.0	23.0	25.0	26.5	28.0
40	11.5	15.5	19.0	22.0	24.5	26.5	29.0	30.5	32.5
50	12.5	17.0	21.0	24.0	27.0	29.5	32.0	34.5	36.0
60	13.5	18.5	22.5	26.5	29.5	32.0	35.0	37.0	39.0
80	14.5	20.5	25.0	29.5	33.0	36.5	39.5	42.0	44.0
100	15.5	21.5	27.0	32.0	36.5	40.5	43.0	4605	48.5
120	15.5	22.5	29.5	34.0	39.0	43.0	46.5	50.5	53.0
No Limit	15.5	23.5	29.5	35.0	40.5	44.5	48.5	52.0	55.5

PART III

RULES FOR CALCULATION BY REFERENCE TO
AGGREGATE NOTIONAL AREA

1. The conditions of this Part shall be satisfied if a building is so constructed that the aggregate notional area of the unprotected areas in the side of a building or compartment does not exceed---

(a) 210 square metres (if the building or compartment is of Purpose Group I, II, III, IV, or VII); or

(b) 90 square metres (if the building or compartment is of Purpose Group V, Vi or VIII);

such calculation being made by reference to any one of a series of vertical data, measured at intervals of not more then 3 metres from one another along the relevant boundary

2. For the purposes of this Part---

"aggregate national area" means the aggregate of the areas of any unprotected areas in the side of a building or compartment, each such area being multiplied by the factor specified in the Table to this Part according to the distance of such unprotected area from the vertical datum;

"vertical datum" means a vertical line of unlimited height at any point on the relevant boundary;

"the datum line" means the line joining a vertical datum to the nearest point of the side of the building or compartment.

3. For the purposes of this Part, no account shall be taken of any unprotected area in the side of a building or compartment which is---

(a) screened from the vertical datum by any part of an external wall which is not an unprotected area; or

(b) outside a horizontal are having its centre at a point through which the vertical datum passes and having a radius measuring 50 metres and extending 90^0 on either side of the datum line; or

(c) facing away from the vertical datum, or making an angle not exceeding 10^0 with a line drawn from it to the vertical datum.

TABLE OF FACTORS

Distance of unprotected area from vertical datum in metres		*Factor*
Not less than	*Less than*	
1	1.2	80
1.2	1.8	40
1.8	2.7	20
2.7	4.3	10
4.3	6.0	4
6.0	8.5	2
8.5	12.0	1
12.0	18.5	0.5
18.5	27.5	0.25
27.5	50	0.1
50	No limit	0

PART IV

RULES FOR CALCULATION IN RESPECT OF CERTAIN BUILDINGS OF PURPOSE GROUP I OR III

1. The provisions of this Part apply only to any building of Purpose Group I or III, which has not more than three storeys and of which no side (measured on an elevation) exceeds 24 metres in length.

2. The conditions of this Part shall be satisfied if the distance between any part of a side of a building and the relevant boundary is not less than the minimum distance specified in the Table to this Part according to the length of such side and the total area of any unprotected areas to be taken into account.

TABLE TO PART IV

PERMITTED UNPROTECTED AREAS IN CERTAIN RESIDENTIAL BUILDINGS

Minimum distance (in metres) between side of building	*Length of side (in metre) not exceeding*	*Total area of unprotected area (in square metres) not exceeding*
(1)	(2)	(3)
1	24	5.6
2.5	24	15
5.0	12	up to the whole area of the wall
6.0	24	up to the whole area of the wall

SEVENTH SCHEDULE

MAXIMUM TRAVEL DISTANCES

(By-law 165 (4), 166 (2), 167 (1), 170 *(b)*)

Purpose Group		*Limit when alternative exits are available*		
		(1)	(2)	(3) metre
		**Dead-End Limit (metre)*	*Un-sprinklered*	*Sprinklered*
I.	**Small Residential**	NR	NR	NR
II.	**Institutional**			
	Hospitals, Nursing Homes etc	9	30	45
	School	6	45	60
	Open Plan	NR	30	45
	Flexible Plan	NR	45	60
III.	**Other Residential**			
	Hotels	10	30	45
	Flats	10	30	45
	Dormitories	0	30	45
IV.	**Office**	15	45	60
V.	**Shops**	15	60	45
VI.	**Factory**			
	General and Special Purpose	15	30	45
	High Hazard	0	22	22.5
	Open structures	NR	NR	NR
VII.	**Place of Assembly**	NR	45	61
VIII.	**Storage and General**			
	Low and Ordinary hazard	NR	NR	NR
	High Hazard	NR	22.5	30
	Parking Garages	15	30+	45x
	Aircraft Hangars (Ground Floor)	NR	30+	45+
	Aircraft Hangars (Mezzanine Floor)	NR	22.5	22.5

NR---No requirements or not applicable.

x Limits distance of travel on floor below in the street in sprinklered garags to 30 metres.

* The dead-end limit shall be the distance to a storey exit or pt a point where alternative means of escape is available provided that the total travel distance shall not exceed the limit under (2).

+ Refer only to aircraft hangars. In any building used for aircraft assembly or other occupancy undivided floor areas so large that the distance from points within the area to the nearest outside walls where exit doors could be provided are in excess of 45 metres requirements for distance to exits may be satisfied by providing stairs leading to exit tunnels or to overhead passageways. In cases where such arrangements are not practicable other arrangements for one-storey buildings, with distances in excess of the maximum, travel distances of not more than 30 metres or 45 metres in building protected by a complete automatic sprinkler system, may be permitted if complete automatic sprinkler protection is provided and if the height of ceiling curtain boards and roof ventilation is such as to minimise the possibility that employees will be overtaken by the spread of fire or smoke within of 1.8 metres of the floor level before they have time to reach exits provided however that in no case may be distance to travel to reach the nearest exit exceed 120 metres.

In an open plan the direct distance shall be two-third of the travel distance.

SEVENTH SCHEDULE

CALCULATION OF OCCUPANT LOAD AND CAPACITY OF EXITS

(By-law 167 (2), 168 (2), 170 *(c),* 171 *(c)*, 175)

Purpose Group		*Occupant load square metre per*	*CAPACITY EXITS* *No. of persons per unit --- Exit Width*					
			Doors outside	*Horizontal Exit*	*Ramp Main Exit*	*Ramp Sec. Exit*	*Escalator*	*Stairs*
I.	**Small Residential**	NR	NR	NR	NR	NR	NR	NR
II.	**Institutional**		100	100	100	60	-	60
	Class-room Area	2 net						
	Workshop and Vocational areas	4.5 net						
	Day Nurseries with sleeping facilities	3.5 net						
	Hospital	-	30	30	30	30	-	22
	Sleeping Departments	12 Gross						
	In-patient Departments	24 Gross						
III.	**Other Residential**	20 Gross	100	60	60	60	45	45
	Flats	4 Gross						
	General public areas in Hotels	24 Gross						

	(Bedroom in hotels at 2 person per room)							
IV.	**Office**	10 Gross (4)	100	100	100	60	60	60
V.	**Shops**	-	100	100	100	60	60	60
	Street floor and sale basement	3 Gross (4)						
	Other floors	6 gross (4)						
	Storage and shipping	10 gross						
VI.	**Factory**	10 gross	100	100	100	60	60	60
VII.	**Places of Assembly**	1.5 net	100	100	100	75	75	75
	Areas of concentrated use without fixed seating	0.7 net						
	Standing space	0.3 net						

NR---No requirements or not applicable.

Exits are measured in units of 550 millimetres width.

The capacity in number of persons of a unit of exit width varies from 30 person per unit of exit width in places of assembly.

Main exit 50% of the total required exit width.

In determining the units for an exit doorway, only the clear width of the doorway when the door is in the open position is to be measured.

Excluding any areas occupied by staircases, lifts, sanitary accommodations and any other space occupied by machinery for any lift, air-conditioning system or similar service provided for the building.

EIGHTH SCHEDULE

CLASSIFICATION RESTRICTION OF SPREAD OF

FLAME OVER SURFACES OF WALLS AND CEILINGS

(By-law 204, 206)

Purpose Group		*Exits*	*Access to Exits*	*Other Spaces*
I.	Small Residential	NR	NR	NR
II.	Institutional	0	0	3
	Open plan or flexible plan	0	0	3 3 for movable partitions not over 2.1 m high
	Hospitals, nursing homes or residential -- custodial care	0	0	1 2 in individual room with capacity not more than 4 person
III.	Other Residential			
	Flats	1	1	3
	Dormitories	1	1	3
	1 and 2 family houses lodging or boarding houses	0	0	3
	Hotels	0	0	3
IV.	Office	1	1	3
V.	Shop -- Class A	0	0	Ceiling 2 Walls 3
	Shop -- Class B	0	0	Ceiling 2 Walls 3
	Shop -- Class C	0	0	3
VI.	Factory	3	3	3

NR -- No requirements or not applicable.

Class A Places of Assembly --- 1000 persons or more.

Class B Places of Assembly --- 300 to 1000 persons.

Class C Places of Assembly --- 100 to 300 persons.

Class A Shops --- stores having aggregate gross are of 3000 square metres or more, or utilizing more than 3 floor levels for sale purposes.

Class B Shops --- stores of less than 3000 metres aggregate gross area, but over 300 square metres or utilizing any floors above or below ground floor level for sale purposes, except that if more than 3 floors are utilized, store shall be Class A.

Class C Shops --- stores of 300 square metres or less gross area, used for sales purposes on ground floor level only.

Class O

Asbestos-cement sheets

Asbestos insulation board

Asbestos insulation board, or plaster, or concrete, or metal sheets finished with oil-based polymer paints.

Plasterboard
Fiber insulation board
Hardboard
Compressed straw slabs
} finished with not less than 3.2 mm of non-combustible surface

Class 1

Wood-wood slabs

Fiber insulation board with asbestos felt surface, on the exposed face.

Compressed straw slabs, with asbestos felt surface on the exposed face.

Fiber insulation board, 1 coat non-washable distemper on a sized board.

Timber or plywood or fiber insulation board or hardboard painted with a fire retardant paint.

Class 2 or 3

Fiber insulation board finished with one coat or washable distemper or one coat of flat oil-paint.

Timber or plywood of destiny greater than $0.4 g/cm^3$.

Hardwood or softwood finished with oil-based or polymer paints.

Plywood finished with oil-based or polymer paints.

Hardboard.

Hardboard finished with oil-based or polymer paints.

Hardboard with wall paper finished with oil-based or polymer paints.

Class 4

Untreated fiber insulated board.

NOTIONAL DESIGNATION OF ROOF CONSTRUCTIONS

(By-law 207 (1) *(b)*, 208 *(a)*)

PART I

PITCHED ROOFS COVERED WITH SLATES OR TILES

Covering material	*Supporting structure*	*Designation*
1. Natural slates 2. Asbestos cement slates 3. Clay tiles 4. Concrete tiles	Timber rafter with or with out underfelt on barking or boarding woodwoll slabs, wood chipboard or insulating fireboard	AA
5. Bitumen felt strip slates, asbestos or fiber based	Timber rafters and boarding	CC
6. Bitumen felt strip slates, asbestos based, mineral surfaced with an under-layer of self-finished asbestos felt minimum 13.6 kg	Timber rafters and boarding	BB

The test referred to in BS 476: Part I

PART II

PITCHED ROOFS COVERED WITH PREFORMED SELE-SUPPORTING SHEETS

Covering material	*Supporting structure*	*Designation*
Corrugated sheets of---		
	Main structure of timber, steel or concrete and covering in either---	
(a) galvanished steel, or *(c)* aluminium, or *(d)* asbestos-cement	*(a)* single-skin construction without underlay or with underlay of: (i) asbestos insulating board, or (ii) plasterboard or (iii) fireboard treated to achieve Class 1 in spread of flame test*, or (iv) Woodwool slab, or	AA
	(b) double-skin construction without interlayer or with interlayer of resin-bonded or bitumen glass fiber	AA

PART III

PITCHED OR FLAT ROOFS COVERED WITH FULLY SUPPORTED MATERIALS

	Supporting structure			
	Timber joists and boarding not less than 22.4 mm thick	Steel or timber joists with deck of--- *(a)* woodwool slabs, or *(b)* compressed straw slabs 50.11 mm thick, or *(c)* wood chipboard not less than 22.4 mm or *(d)* insulting fibreboard not less than 25 mm thick	Slab of concrete or clay pot, insitu or precast concrete: or non-combustible deck or steel, aluminium or asbestos-cement with or without insulation
	Tongued Plain and edged grooved		
Aluminium, copper or zinc sheets	AA	AA	AA	AA
Lead sheet	AA	BA	AA	AA
Mastic asphalt	AA	AA	AA	AA

PART IV

A. FLAT ROOFS

ROOF'S COVERED WITH BITUMEN FELT

DETAILS OF FELT: TYPE, WEIGHT BASE AND FINISH

	Under layer or layers	*Upper layer*	*Combustible Deck*		*Steel or timber beams*		*Non-combustible Deck*		
			Timber joints with 25 mm (nom) P.E, or T. and G boarding (lower layer nailed)	*Stressed skin plywood cavity deck: Thicknes of plywood 19 mm*	*Supporting com- pressed straw slabs*	*Supporting wood wool slabs*	*Asbestos cement cavity deck*	*Steel or aluminium deck: single skin or cavity*	*Concrete or clayport slab in situ precast*
							Overlaid insulting fibreboard in accordance with BS 1142:1961 (section One 2b)		
Flat roof with two or three layer felt, 13 kg/10sq. metres bitumen bonding compound and between layer or felt.	1. Type 1C, self-finished or sanded bitumen felt, minimum 13 kg	Type 1C, self-finished or *(a)* lightly sanded bitumen felt *(b)* mini- mum 13 kg	AA	AA	AA	AA	AA	AA	AA
	2. Type 1C, self-finished or lightly sanded bitumen felt, minimum 13 kg	Type 2 B, self-finished or *(a)* lightly sanded bitumen asbestos felt *(b)* minimum 13 kg	AA	AA	AA	AA	AA	AA	AA
	3. Type 2B, self-finished or lightly sanded bitumen asbestos felt, minimum 13 kg	Type 2 B, self-finished or *(a)* lightly sanded bitumen asbestos felt *(b)* minimum 13 kg	AA	AA	AA	AA	AA	AA	AA
	4. Type 5A, bitumen glass fibre felt, minimum 13 kg	Type 5A, bitumen *(a)* glass fibre felt *(b)* minimum 13 kg	AA	AA	AA	AA	AA	AA	AA

NOTES:
Any reference in this part of this table to a type of layer of felt is reference to that type as listed in BS 747:1961-

(a) with bitumen-bedded mineral chipping 9.54 mm by 15.9 mm spread evenly shoulder 49.18 -- 57.37 mm^2 per tonne

(b) with bitumen- bedded tiles of asbestos cement or tiles of other non-combustible material.

B. PITCHED ROOFS

DETAILS OF FELT: TYPE, WEIGHT BASE AND FINISH

	Under layer or layers	*Upper layer*	*Timber joints with 25 mm (nom) P.E, or T. and G boarding (lower layer nailed)*	*Combus-tible Deck Stressed skin plywood cavity deck: Thickness of plywood 6 mm*	*Steel or timber beams*		*Non-combustible Deck*		
					Suppor- ting com-pressed straw slabs	*Suppor- ting wood wool slabs*	*Asbestos cement cavity deck*	*Steel or alu-minium deck: single skin or cavity*	*Concrete or clayport slab in situ precast*
							Overlaid insulting fibreboard in accordance with BS 1142:1961 (section One 2b)		
Flat roof with two or three layer felt, 13 kg/10sq. metres bitumen bonding compound and between layer or felt.	1. Type 1C, self- finished lightly sanded bitumen felt minimum 13kg	Type 1E, Mineral surfaced bitumen felt 36.3 kg	CC	CC	AC	AC	AC	-	AC
	2. Type 1C, self- finished lightly sanded bitumen felt, minimum 13 kg	Type 2 C, Mineral surfaced asbestos bitumen felt 36.3 kg	BB	BB	AB	AA	AA	AA	AA
	3. Type 2B, self- finished or lightly sanded bitumen asbestos felt, minimum 13 kg	Type 2C, Mineral surfaced asbestos bitumen felt 36.3 kg	AB	AB	AB	AA	AA	AA	AA
	4. Type 5A, bitumen glass fibre felt, minimum 13 kg	Type 5B, Mineral surfaced bitumen, glass fibre felt 36.3 kg	CC	BC	AC	AB	AB	AB	AB
Pitched roof with single layer felt	Type IE, mineral surfaced bitumen felt 36.3 kg		CC	CC	AC	AC	AC	AC	AC

Notes:

Any reference in this part of this table to a type of layer of felt is reference to that type as listed in BS 747:1961---

(a) with bitumen-bedded mineral chipping 9.54 mm by 15.9 mm spread evenly shoulder 49.18 -- 57.37 mm^2 per tonne

(b) with bitumen- bedded tiles of asbestos cement or tiles of other non-combustible material.

NINTH SCHEDULE

LIMITS OF COMPARTMENTS AND MINIMUM PERIODS OF

FIRE RESISTANCE FOR ELEMENTS OF STRUCTURE

(By-law 142 (3), 147, 158 (1), 162, 213, 216 (2))

(Minimum periods of fire resistance)

In this Table--

*"*cubic capacity" means the cubic capacity of the building or if the building is divided into compartments, the compartment of which the element of structure forms part;

"floor area" means the floor area of each storey in the building or, if the building is dividend into compartments, of each storey in the compartment of which the element of structure forms part;

"height" has the meaning assigned to the expression by paragraph (2) of by-law 215.

PART I--BUILDINGS OTHER THAN SINGLE STOREY BUILDINGS

Purpose group	*Maximum dimensions*			*Minimum period of fire resistance (in hours) for elements of structure (*) forming part of--*		
	Height (in m)	Floor area (in m?)	Cubic capacity (in m?)	ground storey or upper storey	basement store	
(1)	(2)	(3)	(4)	(5)	(6)	
I (Small residential) House having not more than three						
Storeys	No limit	No limit	No limit	½	1*(α)*	x
House having four storeys	No limit	250	No limit	1*(b)*	1	x
House having any number of storeys	No limit	No limit	No limit	1	1½	
II (Institutional)	28	2 000	No limit	1	1½	
	over 28	2 000	No limit	1½	2	
III (Other residential)						
Building or part(†) having not more						
than two storeys	No limit	500	No limit	½	1	x
Building or part(†) having three storeys	No limit	250	No limit	1*(b)*	1	
Building having any number of storeys	28	3 000	8500	1	1½	
Building having any number of storeys	No limit	2000	5500	1½	2	
IV (Office)	7.5	250	No limit	0	1*(c)*	x
	7.5	500	No limit	½	1	

	15	No limit	3 500	1*(b)*	1	
	28	5 000	14 000	1	1½	
	No limit	No limit	No limit	1½	2	
V (Shop)	7.5	1 150	No limit	0	1*(c)*	x
	7.5	500	No limit	½	1	
	15	No limit	3 500	1*(b)*	1	
	28	1 000	7 000	1	2	
	No limit	2 000	7 000	2	4	y
VI (Factory)	7.5	250	No limit	0	1*(c)*	x
	7.5	No limit	1 700	?	1	
	15	No limit	4 250	1*(b)*	1	
	28	No limit	8 500	1	2	
	28	No limit	28 000	2	4	
	over 28	2 000	5 500	2	4	
VII (Assembly)	7.5	250	No limit	0	1*(c)*	x
	7.5	500	No limit	½	1	
	15	No limit	3 500	*(b)*	1	
	28	5 000	14 000	1	1½	
	No limit	No limit	No limit	1½	2	
VIII (Storage and general)	7.5	150	No limit	0	1*(c)*	x
	7.5	300	No limit	½	1	
	15	No limit	1 700	1*(b)*	1	
	15	No limit	3 500	1	2	
	28	No limit	7 000	2	4	
	28	No limit	21 000	4	4	
	over 28	1 000	No limit	4	4	

Notes to Part I

For the purpose of paragraph (2) of by-law 142 the period of fire resistance to be taken as being relevant to an element of structure is the period included in column (5) or (6), whichever is appropriate, in the line of entries which specifies dimensions with all of which there is conformity or, if there are two or more such lines, in the topmost of those lines.

(*) A floor which is immediately over a basement storey shall be deemed to be an element of structures forming part of a basement storey.

(†) The expression "part" means a part which is separated as described in paragraph (2) of by-law 215.

(a) The period is half an hour for elements forming part of a basement storey which has an area not exceeding 50 m2.

(b) This period is reduced to half an hour in respect of a floor which is not a compartment floor, except as to the beams which support the floor or any part of the floor which contributes to the structural support of the building as a whole.

(c) No fire resistance is required if the elements form part of a basement storey which has an area not exceeding 50 m2.

x The items as marked are applicable only to buildings, not to compartments, except in relation to purpose group III, see also paragraph 3 *(a)* of by-law 142 and paragraph (1) of by-law 147.

y If the building is fitted throughout with an automatic sprinkler system which complies with the relevant recommendations of CP402.201: 1952, any maximum limits specified in columns (3) and (4) shall be doubled.

(Minimum periods of fire resistance)

PART 2--SINGLE STOREY BUILDINGS

Purpose group	*Maximum floor area (in m?)*	*Minimum period of fire resistance (in hours) for elements of structure*	
(1)	(2)	(3)	
I (Small residential)	No limit	½	z
II (Institutional)	3 000	½	z
III (Other residential)	3 000	½	z
IV (Office)	3 000	½	z
	No limit	1	
V (Shop)	2 000	½	z
	3 000	1	
	No limit	2	
VI (Factory)	2 000	?	z
	3 000	1	
	No limit	2	
VII (Assembly)	3 000	½	z
	No limit	1	
VIII (Storage and general)	500	½	z
	1 000	1	
	3 000	2	
	No limit	4	

Notes to Part 2

For the purpose of paragraph (2) of by-law 142, the period of fire resistance to be taken as being relevant to an element of structure is the period included in column (3) in the line of entries which specifies the floor area with which there is conformity or, if there are two or more such lines.

z *See* paragraph 3 *(a)* of by-law 142 and paragraph (1) of by-law 147.

SUSPENDED CEILINGS

(By-law 148 (6), 219)

Height of building	Type of floor	Required fire resistance of floor	Description of suspended ceiling
(1)	(2)	(3)	(4)
Less than 15 m	Non-compartment	1 hour or less	Surface of ceiling exposed within the cavity not lower than Class 1 (as to surface spread of flame).
	Compartment	Less than 1 hour	
	Compartment	1 hour	Surface of ceiling exposed within the cavity not lower than Class O (as to surface spread of flame); supports and fixings for the ceiling non-combustible.
15 m or more	Any	1 hour or less	Surface of ceiling exposed within the cavity not lower than Class O (as to surface spread of flame) and joint-less; supports and fixings for the ceiling non-combustible.
Any	Any	more than 1 hour	Ceiling of non-combustible construction and joint-less; supports and fixings for the ceiling non-combustible.

NOTIONAL PERIODS OF FIRE RESISTANCE

(By-law 158 (3), 224)

In this Table:

(a) "Class 1 aggregate" means foamed slag, pumice, blast furnace slag, pelleted fly ash, crushed brick and burnt clay products (including expanded clay), well-burnt clinker and crushed limestone.

"Class 2 aggregate" means flint gravel, granite, and all crushed natural stones other than limestone.

(b) Any reference to plaster means:

(i) in the case of an external wall 1 m or more from the relevant boundary, plaster applied on the internal face only;

(ii) in the case of any other wall, plaster applied on both faces;

(iii) if to plaster of a given thickness on the external face of a wall, except in the case of a reference to vermiculite-gypsum or perlite-gypsum plaster, rendering on the external face of the same thickness;

(iv) if to vermiculite-gypsum plaster, vermiculite-gypsum plaster of a mix within the range of 1? to 2:1 by volume.

(c) Load assumed to be on inner leaf only except for fire resistance period of four hours.

PART I

WALLS

A. Masonry construction

Construction and materials	*Minimum thickness excluding plaster (in mm) for period of fire resistance of*									
	Loadbearing					*Non-loadbearing*				
	4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*	*4 hrs.*	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
1. Reinforced concrete, minimum concrete cover to main reinforcement of 25 mm:										
(a) unplastered	180	100	100	75	75					
(b) 12.5 mm cement-sand plaster	180	100	100	75	75					
(c) 12.5 mm gypsum-sand plaster	180	100	100	75	75					
(d) 12.5 mm vermiculite-gypsum plaster	125	75	75	63	63					
2. No-fines concrete of Class 2 aggregate:										
(a) 12.5 mm cement-sand plaster						50				
(b) 12.5 mm gypsum-sand plaster						150				
(c) 12.5 mm vermiculite-gypsum plaster						150				
3. Bricks of clay, concrete or sand-lime:										
(a) unplastered	200	100	100	100	100	170	100	100	75	75
(b) 12.5 mm cement-sand plaster	200	100	100	100	100	170	100	100	75	75
(c) 12.5 mm gypsum-sand plaster	200	100	100	100	100	170	100	100	75	75
(d) 12.5 mm vermiculite-gypsum plaster or perlitegypsum* plaster	100	100	100	100	100	100	100	100	75	75
4. Concrete blocks of Class 1 aggregate:										
(a) unplastered	150	100	100	100	100	150	75	75	75	50
(b) 12.5 mm cement-sand plaster	150	100	100	100	100	100	75	75	75	50
(c) 12.5 mm gypsum-sand plaster	150	100	100	100	100	100	75	75	75	50
(d) 12.5 mm vermiculite-gypsum plaster	100	100	100	100	100	75	75	62	50	50
5. Concrete blocks of Class 2 aggregate:										
(a) unplastered		100	100	100	100	150	100	100	75	50
(b) 12.5 mm cement-sand plaster		100	100	100	100	150	100	100	75	50
(c) 12.5 mm gypsum-sand plaster		100	100	100	100	150	100	100	75	50
(d) 12.5 mm vermiculite-gypsum plaster	100	100	100	100	100	100	75	75	75	50
6. Autoclaved aerated concrete blocks density 475 -- 1 200 kg/m?	180	100	100	100	100	100	62	62	50	50
7. Hollow concrete blocks, one cell in wall thickness, of class 1 aggregate:										
(a) unplastered		100	100	100	100	150	100	100	100	75
(b) 12.5 mm cement-sand plaster		100	100	100	100	150	100	75	75	75
(c) 12.5 mm gypsum-sand plaster		100	100	100	100	150	100	75	75	75

(d) 12.5 mm vermiculite-gypsum plaster		100	100	100	100	100	75	75	62	62
8. Hollow concrete blocks, one cell in wall thickness, of class 2 aggregate:										
(a) unplastered						150	150	125	125	125
(b) 12.5 mm cement-sand plaster						150	150	125	125	100
(c) 12.5 mm gypsum-sand plaster						150	150	125	125	100
(d) 12.5 mm vermiculite-gypsum plaster						125	100	100	100	75
9. Cellular clay blocks not less than 50% solid:										
(a) 12.5 mm cement-sand plaster									100	75
(b) 12.5 mm gypsum-sand plaster									100	75
(c) 12.5 mm vermiculite-gypsum plaster						200	100	100	100	62
10. Cavity wall with outer leaf of bricks or blocks of clay, composition, concrete or sand-lime, not less than 100 mm thick and:										
(a) inner leaf of bricks or blocks of clay, composition, concrete or sand-lime	100	100	100	100	100	75	75	75	75	75
(b) inner leaf of solid or hollow concrete bricks or blocks of Class 1 aggregate.	100	100	100	100	100	75	75	75	75	75
11. Cavity wall with outer leaf of cellular clay blocks as 9 above and inner leaf of autoclaved aerated concrete blocks, density 475--1 200 kg/m?	150	100	100	100	100	75	75	75	75	75

* Perlite-gypsum plaster to clay bricks only.

B. Framed and composite construction (non-loadbearing)

Construction and materials	*Period of fire resistance in hours*
1. Steel frame with external cladding of 16 mm rendering on metal lathing and internal lining of autoclaved aerated concrete blocks, density 480--1 120kg/m? of thickness of--	
50 mm	2
62 mm	3
75 mm	4
2. Steel frame with external cladding of 100 mm concrete blocks and internal lining of 16 mm gypsum plaster on metal lathing	4
3. Steel frame with external cladding of bricks of clay, concrete or sand-lime 100 mm thick and internal lining of asbestos insulating board of thickness of 9 mm.	3
4. Steel frame with external cladding of 16 mm rendering on metal lathing and internal lining of--	
9 mm asbestos insulating board	½
16 mm gypsum plaster on metal lathing	1
5. Steel or timber frame with facings on each side of--	
(a) metal lathing with cement-sand or gypsum plaster of thickness of--	

19 mm	1
12.5 mm	½
(b) metal lathing with vermiculite-gypsum or perlite-gypsum plaster of thickness of--	
25 mm	2
19 mm	1½
12.5 mm	1
(c) 9.5 mm plasterboard with gypsum plaster of thickness of 5 mm.	½
(d) 9.5 mm plasterboard with vermiculite-gypsum plaster of thickness of--	
25 mm	2
16 mm	1½
10 mm	1
5 mm	½
(e) 12.5 mm plasterboard--	
unplastered	1
(f) 12.5 mm plasterboard with vermiculite-gypsum plaster of thickness of--	
25 mm	2
16 mm	1½
10 mm	1
(g) 19 mm plasterboard (or two layers of 9.5 mm fixed to break joint) without finish	1
(h) 19 mm plasterboard (or two layers of 9.5 mm) with vermiculite-gypsum plaster of thickness of--	
16 mm	2
10 mm	1½
(i) 12.5 mm fibre insulating board with gypsum plaster of thickness of 12.5 mm	½
(j) asbestos insulating board not less than 9 mm thick with 9 mm fillets to face of studs	½
(k) asbestos insulating board not less than 12 mm thick	½
(l) 25 mm wood wool slabs with gypsum plaster of thickness of 12.5 mm	1
6. Compressed straw slabs in timber frames finished on both faces with gypsum plaster of thickness of 5 mm	1
7. Plasterboard 9.5 mm cellular core partition--	
(a) unplastered	½
(b) 12.5 mm gypsum plaster	1
(c) 22 mm vermiculite-gypsum plaster	2
8. Plasterboard 12.5 mm cellular core partition--	
(a) unplastered	½
(b) 12.5 mm gypsum plaster	1
(c) 16 mm vermiculite-gypsum plaster	2
9. Plasterboard 19 mm finished on both faces with 16 mm gypsum plaster	1

10. Plasterboard 12.5 mm bonded with neat gypsum plaster to each side of 19 mm plasterboard	1½
11. Three layers of 19 mm plasterboard bonded with neat gypsum plaster	2
12. Wood wool slab with 12.5 mm render or plaster of thickness of--	
75 mm	2
50 mm	1
13. Compressed straw slabs, with 75 mm by 12.5 mm wood cover strips to joints, of thickness of 50 mm	½

C. External walls more than 1 m from the relevant boundary (non-load bearing)

	Construction and materials	*Period of fire resistance in hours*
1.*	Steel frame with external cladding of non-combustible sheets and internal lining of--	
	(a) 9 mm asbestos insulating board	4
	(b) 12.5 mm cement-sand or gypsum plaster on metal lathing	4
	(c) sprayed asbestos of thickness of 12.5 mm	4
	(d) two layers of 9.5 mm plasterboard	½
	(e) 9.5 mm plasterboard finished with gypsum plaster of thickness of 12.5 mm	½
	(f) 12.5 mm plasterboard finished with 5 mm gypsum plaster	½
	(g) 50 mm compressed straw slabs	½
	(h) 50 mm compressed straw slabs finished with 5 mm gypsum plaster	1
*2.	Timber frame with external cladding of 10 mm cement-sand or cement-lime rendering and internal lining of--	
	(a) 9 mm asbestos insulating board	1
	(b) 16 mm gypsum plaster on metal lathing	1
	(c) 9.5 mm plasterboard finished with 12.5 mm gypsum plaster	1
	(d) 12.5 mm plasterboard finished with 5 mm gypsum plaster	1
	(e) 50 mm compressed straw slabs	1
	(f) aerated concrete blocks--	
	500 mm	3
	62 mm	4
	75 mm	4
	100 mm	4
3.	Timber frame with external cladding of 100 mm clay, concrete or sand-lime bricks or blocks, finished internally with--	
	(a) asbestos insulating board	4
	(b) 16 mm gypsum plaster on metal lathing	4
*4.	Timber frame with external cladding of weather boarding or 9.5 mm plywood and internal lining of--	
	(a) 9 mm asbestos insulating board	½

	(b) 16 mm gypsum plaster on metal lathing	½
	(c) 9.5 mm plasterboard finished with 12.5 mm gypsum plaster	½
	(d) 12.5 mm plasterboard finished with 5 mm gypsum plaster	½
	(e) 50 mm compressed straw slabs	½
	(f) 75 Mm wood wool slabs faced each side with asbestos-cement	2
	(g) aerated concrete blocks--	
	50 mm	3
	62 mm	4
	75 mm	4
	100 mm	4

* The presence of a combustible vapour barrier within the thickness of these constructions will not affect these periods of fire resistance.

NINTH SCHEDULE - cont. I

PART II

REINFORCED CONCRETE COLUMNS

	Construction and materials	*Minimum dimension of concrete column* without finish (in mm) for a fire resistance of--*				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
1.	*(a)* without plaster	450	300	250	200	150
	(b) with 12.5 mm cement-sand or gypsum-sand plaster on mesh reinforcement fixed around column	300	225	150	150	150
	(c) finished with 12.5 mm encasement of vermiculite-gypsum plaster	275	200	150	120	120
	(d) with 2.5 mm hard drawn steel wire fabric, of maximum pitch 150 mm in each direction, placed in concrete cover to main reinforcement	300	225	200	150	150
	(e) with limestone or light-weight aggregate as coarse aggregate	300	225	200	200	150
2.	Built into †any separating wall, compartment wall or external wall‡--					
	(a) without plaster	180	100	100	75	75
	(b) finished with 12.5 mm of vermiculite-gypsum plaster	125	75	75	63	63

* The minimum dimension of a circular column is the diameter.
† No part of column projecting beyond either face of wall.
‡ Having not less fire resistance than that of the column and extending to the full height of, and not less than 600 mm on each side of, the column.

PART III

REINFORCED CONCRETE BEAMS

Construction and materials		Minimum concrete over without finish to main reinforcement (in mm) for a fire resistance of--				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
1.	*(a)* without plaster	63	45	35	25	12.5
	(b) finished with 12.5 mm vermiculite-gypsum plaster	25	12.5	12.5	12.5	12.5
	(c) with 2.5 mm cement-sand or gypsum-sand plaster on mesh reinforcement fixed around beam	50	30	20	12.5	12.5

PART IV

PRESTRESSED CONCRETE BEAMS WITH POST-TENSIONED STEEL

Cover reinforcement	*Additional protection*	*Minimum concrete cover to tendons (in mm) for a fire resistance of--*			
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*
None	*(a)* none				38
	(b) vermiculite concrete slabs (permanent shuttering 12.5 mm thick		38	25	25
	(c) plaster 12.5 mm thick on mesh reinforcement fixed around beam		50	38	25
	(d) vermiculite-gypsum plaster 12.5 mm thick or sprayed asbestos 10 mm thick		38	25	25
Light mesh reinforcement (having a minimum concrete cover of 25 mm) to retain the concrete in position around the tendons	*(a)* none	100	63	63	
	(b) plaster 12.5 mm thick on mesh reinforcement	90			
	(c) vermiculite concrete slabs (permanent shuttering) 12.5 mm thick	75			
	(d) vermiculite concrete slabs (permanent shuttering) 25 mm thick	50			
	(e) vermiculite-gypsum plaster 12.5 mm thick	50			
	(f) vermiculite-gypsum plaster 22 mm thick	50			
	(g) sprayed asbestos 10 mm thick	75			
	(h) sprayed asbestos 19 mm thick	50			

PART V

STRUCTURAL STEEL

A. Encased steel stanchions (Mass per metre not less than 45 kg)

	Construction and materials	*Minimum thickness (in mm) of protection for a fire resistance of--*				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½hr.*
(A)	Solid Protection *(unplastered)					
1.	Concrete not leaner than 1:2:4 mix with natural aggregates--					
	(a) concrete not assumed to be loadbearing, reinforced†	50	25	25	25	25
	(b) concrete assumed to be loadbearing, reinforced in accordance with BS 449: Part 2: 1969	75	50	50	50	50
2.	Solid bricks of clay, composition or sand-lime	75	50	50	50	50
3.	Solid blocks of foamed slag or pumice concrete reinforced† in every horizontal joint	62	50	50	50	50
4.	Sprayed asbestos of density 140--240 kg/m?	44	19	15	10	10
5.	Sprayed vermiculite-cement		38	32	19	12.5
(B)	Hollow Protection‡					
1.	Solid bricks of clay, composition or sand-lime reinforced in every horizontal joint, unplastered	115	50	50	50	50
2.	Solid blocks of foamed slag or pumice concrete reinforced? in every horizontal joint, unplastered	75	50	50	50	50
3.	Metal lathing with gypsum or cement-lime plaster of thickness of		38?	25	19	12.5
4.	*(a)* Metal lathing with vermiculite-gypsum plaster of thickness of	50?	19	16	12.5	12.5
	(b) Metal lathing spaced 25 mm from flanges with vermiculite-gypsum or perlite gypsum plaster of thickness of	44	19	12.5	12.5	12.5
5.	Gypsum plasterboard with 1.6 mm wire binding at 100 mm pitch--					
	(a) 9.5 mm plasterboard with gypsum plaster of thickness of--				12.5	12.5
	(b) 19 mm plasterboard with gypsum plaster of thickness of		12.5	10	7	7
6.	Gypsum plasterboard with 1.6 mm wire binding at 100 mm pitch--					
	(a) 9.5 mm plasterboard with vermiculite-gypsum plaster of thickness of--		16	12.5	10	7

	(b) 19 mm plasterboard with vermiculite-gypsum plaster of thickness of	32?	10	10	7	7
7.	Metal lathing with sprayed asbestos of thickness of	44	19	15	10	10
8.	Vermiculite-cement slabs of 4:1 mix reinforced with wire mesh and finished with plaster skim. Slabs of thickness of	63	25	25	25	25
9.	Asbestos insulating boards of density 510-- 880 kg/? (screwed to 25 mm thick asbestos battens for ? hour and 1 hour periods)		25	19	12	9

* Solid protection means a casing which is bedded close to the steel without intervening cavities and with all joints in the casing made full and solid.

† Reinforcement shall consist of steel binding wire not less than 2.3 mm in thickness, or a steel mesh weighing not less than 0.48 kg/m?. In concrete protection, the spacing of that reinforcement shall not exceed 150 mm in any direction.

‡ Hollow protection means that there is a void between the protective material and the steel. All hollow protection to columns shall be effectively sealed at each floor level.

? Light mesh reinforcement required 12.5 mm to 19 mm below surface unless special corner beads are used.

B. Encased steel beams (Mass per metre not less than 30 kg)

Construction and materials		*Minimum thickness (in mm) of protection for a fire resistance of--*				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
(A)	*Solid Protection† (unplastered)*					
1.	*Concrete not leaner than 1:2:4 mix with natural aggregates--*					
	(a) concrete not assumed to be loadbearing, reinforced‡	63	25	25	25	25
	(b) concrete assumed to be loadbearing, reinforced in accordance with BS 449: Part 2: 1969	75	50	50	50	50
2.	Sprayed asbestos of density 140--240 kg/m?	44	19	15	10	10
3.	Sprayed vermiculite-cement		38	32	19	12.5

Construction and materials		*Minimum thickness (in mm) of protection for a fire resistance of--*				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
(B)	Hollow Protection*					
1.	Metal lathing					
	(a) with cement-lime plaster of thickness of		38	25	19	12.5

	(b) with gypsum plaster of thickness of		22	19	16	12.5
	(c) with vermiculite-gypsum or perlitegypsum plaster of thickness of	32	12.5	12.5	12.5	12.5
2.	Gypsum plasterboard with 1.6 mm wire binding at 100 mm pitch--					
	(a) 9.5 mm plasterboard with gypsum plaster of thickness of				12.5	12.5
	(b) 19 mm plasterboard with gypsum plaster of thickness of		12.5	10	7	7
3.	Plasterboard with 1.6 mm wire binding at 100 mm pitch--					
	(a) 9.5 mm plasterboard nailed to wooden cradles finished with gypsum plaster of thickness of					12.5
	(b) 9.5 mm plasterboard with vermiculite-gypsum plaster of thickness of		16	12.5	10	7
	(c) 19 mm plasterboard with vermiculite-gypsum plaster of thickness of	32†	10	10	7	7
	(d) 19 mm plasterboard with gypsum plaster of thickness of		12.5			
4.	Metal lathing with sprayed asbestos of density 140--240 kg/m? and of thickness of	44	19	15	10	10
5.	Asbestos insulating boards of density 510--880 kg/m? (screwed to 25 mm thick asbestos battens for ? hour and 1 hour periods)		25	19	12	9
6.	Vermiculite-cement slabs of 4:1 mix reinforced with wire mesh and finished with wire mesh and finished with plaster skin. Slabs of thickness of	63	25	25	25	25
7.	Gypsum-sand plaster 12.5 mm thick applied to heavy duty (Type B as designated in BS 1105:1963) wood wool slabs of thickness of		50	38	38	38

* Hollow protection means that there is a void between the protective material and the steel. All hollow protection to columns shall be effectively sealed at each floor level.

† Solid protection means a casing which is bedded close to the steel without intervening cavities and with all joints in the casing made full and solid.

‡ Reinforcement shall consist of steel binding wire not less than 2.3 mm in thickness, or a steel mesh weighing not less than 0.48 kg/m?. In concrete protection, the spacing of that reinforcement shall not exceed 150 mm in any direction.

PART IV

STRUCTURAL ALUMINIUM

Encased aluminium alloy stanchions and beams (Mass per metre not less than 16 kg)

Construction and materials		*Minimum thickness (in mm) of protection for a fire resistance of--*				
		4 hrs.	*2 hrs.*	*1½ hrs.*	*1 hr.*	*½ hr.*
(A)	Solid Protection*					
1.	Sprayed asbestos of density 140--240 kg/m?		48	32	19	10
2.	Sprayed vermiculite-cement				44	19
(B)	Hollow Protection*					
1.	Metal lathing with vermiculite-gypsum or perlite-gypsum plaster of thickness of		32	22	16	12.5
2.	Metal lathing finished with neat gypsum plaster of thickness of				19	12.5
3.	Gypsum plasterboard 19 mm thick with 1.6 mm wire binding at 100 mm pitch finished with gypsum-vermiculite plaster of thickness of		22	16	10	10
4.	Asbestos insulating boards of density 510--880 kg/m? (screwed to 25 mm thick asbestos battens for the ? hour period)			34	21	9

* Solid protection means a casing which is bedded close to the steel without intervening cavities and with all joints in the casing made full and solid.

† Hollow protection means that there is a void between the protective material and the steel. All hollow protection to columns shall be effectively sealed at each floor level.

NINTH SCHEDULE - cont. II

PART VII

TIMBER FLOORS

	Construction and materials	*Minimum thickness (in mm) for fire resistance of--*		
		1 hr.	*½ hr.*	*modified‡ ½ hr.*
(A)	Plain edge boarding on timber joists not less than 38 mm wide with ceiling of--			
	(i) timber lath and plaster-- thickness of plaster			16
	(ii) timber lath and plaster with plaster of minimum thickness of 16 mm covered on underside with plasterboard of thickness		12.5	
	(iii) metal lathing and plaster-- thickness of plaster			
	(a) gypsum		16	
	(b) vermiculite		12.5	
	(iv) one layer of plasterboard of thickness			12.5
	(v) one layer of plasterboard of minimum thickness of 9.5 mm finished with gypsum plaster of thickness			12.5
	(vi) one layer of plasterboard of minimum thickness of 12.5 mm finished with gypsum plaster of thickness			
	(vii) two layers of plasterboard of total thickness			
	(viii) two layers of plasterboard each of minimum thickness of 9.5 mm finished with gypsum plaster of thickness		5	
	(ix) one layer of fibre insulating board of minimum thickness of 12.5 mm finished with gypsum plaster of thickness			12.5
	(x) one layer of asbestos insulating board of minimum thickness		12	
	(xi) wood wool slab 25 mm thick finished with gypsum plaster of thickness		5	
(B)	Tongued and grooved boarding of not less than 16 mm (finished) thickness* on timber joists not less than 38 mm wide with ceiling of--			
	(i) timber lath and plaster-- thickness of plaster			16
	(ii) timber lath and plaster with plaster of minimum thickness of 16 mm covered on underside with plasterboard of thickness		9.5	
	(iii) metal lathing and plaster-- thickness of plaster			
	(a) gypsum	22	16	
	(b) vermiculite	12.5	12.5	

	(iv) one layer of plasterboard of thickness			9.5
	(v) one layer of plasterboard of minimum thickness of 9.5 mm finished with--			
	(a) gypsum plaster of thickness		12.5	
	(b) vermiculite-gypsum plaster of thickness	12.5		
	(vi) one layer of plasterboard of minimum thickness of 12.5 mm finished with gypsum plaster of thickness		5	
	(vii) two layers of plasterboard of total thickness		22	
	(viii) one layer of fibre insulating board of minimum thickness of 12.5 mm finished with gypsum plaster of thickness			5
	(ix) one layer of asbestos insulating board of minimum thickness		9	
	(x) one layer of asbestos insulating board of minimum thickness of 12 mm finished on top with glass fibre or mineral wool of thickness	25		
	(xi) wood wool slab 25 mm thick finished with--			
	(a) gypsum plaster of thickness		5	
	(b) vermiculite-gypsum plaster of thickness	10		
(C)	Tongued and grooved boarding of not less than 21 (finished) thickness* on timber joist not less than 175 mm deep by 50 mm wide with ceiling of--			
	(i) timber lath and plaster-- thickness of plaster		16	
	(ii) metal lathing and plaster-- thickness of plaster		16	
	(iii) metal lathing and sprayed asbestos† to thickness of	19	12.5	
	(iv) one layer of plasterboard of thickness			9.5
	(v) one layer of plasterboard of minimum thickness of 9.5 mm finished with--			
	(a) gypsum plaster of thickness		12.5	
	(b) vermiculite-gypsum plaster of thickness	12.5		
	(vi) one layer of plasterboard of minimum thickness of 12.5 mm finished with gypsum plaster of thickness		5	
	(vii) two layers of plasterboard of total thickness		19	
	(viii) one layer of fibre insulating board of thickness			12.5
	(ix) one layer of fibre insulating board of minimum thickness of 12.5 mm finished with gypsum plaster of thickness		12.5	
	(x) one layer of asbestos insulating board of thickness		6	
	(xi) wood wool slab 25 mm thick finished with--			
	(a) gypsum plaster of thickness		5	
	(b) vermiculite-gypsum plaster of thickness	10		

* Or an equivalent thickness of wood chipboard.
† Sprayed asbestos in accordance with BS 3590:1970.
‡ The term "modified ? hour" refers to the requirements specified in by-law 223.

PART VIII
CONCRETE FLOORS

Construction and materials	*Minimum thickness of solid substance including screed (in mm)*	*Ceiling finish for a fire resistance of--*								
		4 hours		*2 hours*		*1½ hours*		*1 hour*		*½ hour*
Solid flat slab or filler joist floor. Units of channel or T section	90	25 mm	V or	10 mm	V or	10 mm	V or	7 mm	V or	nil
		25 mm	A	12.5 mm	A	12.5 mm	A	7 m	A	
	100	19 mm	V or	7 mm	V	7 mm	V	nil		nil
		19 mm	A							
	125	10 mm	V or	nil		nil		nil		nil
		12.5mm	A							
	150	nil		nil		nil		nil		nil
Solid flat slab or filler joist floor with 25 mm wood wool slab ceiling base	90					12.5 mm	G	nil		nil
	100			nil		nil		nil		nil
	125	12.5mm	G	nil		nil		nil		nil
	150	nil		nil		nil		nil		nil
Units of inverted U section with minimum thickness at crown	63									nil
	75							nil		nil
	100			nil		nil		nil		nil
	150	nil		nil		nil		nil		nil
Hollow block construction or units of box or 1 section	63									nil
	75							nil		nil
	90			nil		nil		nil		nil
	125	nil		nil		nil		nil		nil
Cellular steel with concrete topping	63	12.5 mm V suspended on metal lathing or 12.5 mm A (direct)		12.5 mm G suspended on metal lathing		12.5 mm G suspended on metal lathing		12.5 mm G suspended on metal lathing		nil

"V"--vermiculite-gypsum plaster. "A"--Sprayed asbestos in accordance with BS 3590:1970 "G"--gypsum plaster

NOTE:

Where a column relating to ceiling finish contains no entry opposite a specification, the notional period of fire. resistance specified in that column is not applicable.

TENTH SCHEDULE

TABLE OF REQUIREMENTS FOR FIRE EXTINGUISHMENT

ALARM SYSTEMS AND EMERGENCY LIGHTING

(By-law 225 (1, 237 (1))

Occupancy Hazard	*Extinguishing System Note 2*	*Fire Alarm System Note 3*	*Emergency Lighting Note 4*
I SMALL			
RESIDENTIAL:			
Private dwelling house	---	---	---
Terrace Type			
Semi Detached			
II INSTITUTIONAL			
1. Educational Occupancies			
(i) Used for instructional purposes only. Open design Balcony approach			
(a) 1 or 2 storeys	---	---	---
(b) 3 to 5 storeys	G	---	---
(c) 6 storeys to 10 storeys	G	2	a
(d) 11 storeys and above	---	1 & 2	a
(ii) Canteen/kitchen detached	---	---	---
(iii) *(a)* Laboratory over 1 000 sq. m	G	1 & 2	a
(iv) Library			
(a) Single storeys --- less than 1 000 sq. m	---	---	---
(b) Two storeys i --- less than 1 000 sq. m	G	---	---
(c) More than 1 000 sq. m or three storeys or more	G	1 & 2	a
(v) Vocational School			
(a) Wood working, metal work 1 or 2 storeys	G	---	---
(b) Three storeys or more	G	1 & 2	---
(c) Areas with central air - conditioning more than 1 000 sq. m	G	1 & 2	---
(d) Multi purpose hall without air conditioning 1 storey	G	---	---
(vi) Grand Hall with fly galleries	G	1 & 2	b

grid-irons riggings for movable scenery			
(vii) Buildings with Central Air-conditioning Two or more storeys 500 sq. m -- 1 000 sq. m exceeding 1 000 sq. m	G G AG	1 & 2 1 & 2 2	b or c b or c b or c
(viii) Educational Institutions in office complexes and shopping complexes	To be considered as part of overall risk		
2. HOSPITAL AND NURSING HOMES			
(i) Clinic-day care	---	---	---
(ii) In-patient Treatment			
(a) Part of office or shopping complex	To be considered as part of overall risk with special requirements for emergency lighting, stretcher lifts etc.		
(b) Not exceeding 250 sq. m per floor			
(ba) Single storey	---	---	a
(bb) 2 storey	---	3	a
(bc) 3 or 4 storeys	G	3	b
(bd) 5 or 6 storeys	G	1 & 3	b or c
(be) 18 m and over	AG	3	b or c
(bf) Operating theatres	G	3	a
(c) Exceeding 250 sq. m per floor			
Single storey	---	---	a
2 storeys	G	3	a
3 or 4 storeys	G	1 & 3	a
5 storeys and over	AG	3	a

NOTE :

(i) Stretcher lift facilities to be provided for buildings above 4 storeys.

(ii) Corridors and landings to be designed to accommodate stretcher and bed movement.

(iii) Design shall be provide for horizontal evacuation of bed patients.

(iv) Laboratories and kitchen shall not have sleeping accommodation above them and shall form separate compartment from in-patient, treatment areas, public areas and staircase and lift discharge areas.

Occupancy Hazard	*Extinguishing System Note 2*	*Fire Alarm System Note 3*	*Emergency Lighting Note 4*
III OTHER RESIDENTIAL			
1. **Hotels**			
(i) Open design balcony approach with open staircase with extended lobby or tower staircase			
(a) 1 storey less than 20 rooms:	---	---	---
(b) (i) 1 - 3 storeys	---	---	a
(ii) More than 50 rooms	G	---	b
(c) 4 - 5 storeys	G	2	b
(d) 6 - 10 storeys	G	1 & 2	c
(e) 11 storeys and over	AG	2	c
(ii) Other designs			
(a) Less than 10 rooms	---	---	a
(b) 11 to 20 rooms	G	2	a
(c) 21 to 50 rooms	G	1 & 2	a
(d) 51 rooms and over			
3 storeys and below	G	---	c
4 storeys and above	AG	2	c
(e) 4 storeys to 6 storeys but less than 20 rooms	G	1 & 2	a
(f) Exceeding 18 m	AG	2	c
(iii) Hotels above shops or office occupancies	But not less than that required for overall occupancy risk or 1 & 2 above		
2. **Hotels and Dormatories**			
(a) (i) Single storey	---	---	---
(ii) 2 - 3 storeys	G	2	a
(iii) 3 storeys to 10 storeys	G	1 & 2	a
(IV) 11storeys and over	AG	2	a
(b) (i) Open balcony approach 11 storeys and over and for other designs 6 storeys and over	AG	2	a
NOTE: Hotels at location that cannot be reached within reasonable time or not accessible to required type and number of fire appliances shall be required to provide higher standard of protection as required by Fire Department.			
3. **Modified Requirement For Flats**			

(a) Walk-up flats 5 storeys and less	---	---	---
(b) Open balcony approach	---	---	---
NOTE: See note for IV - offices for staircase requirements.			
(i) 6 storeys - less than 60 m high	Dry riser/down comer 45.5 cu. m overhead tank. Two units of 30 m x 37 mm hose with control nozzle. Two units of 9 kg ABC dry chemical fire extinguisher located at caretakers flat or fire point on ground floor as required by fire department.		
(ii) Exceeding 60 m	Wet riser, two units of 30 m x 37 mm hose with control nozzle. Two units 9 kg ABC dry chemical fire extinguishers located at caretakers flat or fire point as required by fire department.		
NOTE: See note for IV - offices; see requirements for open staircases.			
(c) Internal staircase or core design			
(i) 6 storeys - 60 m	As for *b*(i) and emergency lighting 'A' for corridor and staircase, fire lift if exceeding 30 m.		
(ii) Exceeding 60 m	As for *b*(ii) hose reel. Fire lift and emergency lighting - 'A'		
(d) Maisonettes built on two or more *levels*	As for *c*(i) or (ii) as applicable and to provide self contained 'Residential Type' detectors.		
(e) Central air-conditioning System			
3 storeys - 5 storeys	G	---	a
6 storeys - 10 storeys	G	2	c
(less than 30 m)	and fire lift and self contained type detectors to be provided.		
10 storeys and over	AG	2	c
	and fire lifts - wet riser in accordance with general requirements.		

Occupancy Hazard	*Extinguishing System Note 2*	*Fire Alarm System Note 3*	*Emergency Lighting Note 4*
IV OFFICES			
1. 4 storeys and less than 1 000 sq. m gross floor area	---	---	---
2. 5 storeys and over or exceeding 1000 sq. m	G	2	a
3. Exceeding 18 m but less than 10 000 sq. m	G	1 & 2	c

4. Exceeding 30 m or 10 000 sq. m	AG	2	c
NOTE: Open balcony approach may have unenclosed staircases if provided with extended landings of not less than twice staircase width and walls separating the staircase from the occupancy be returned for a distance of not less than 1 m along the frontage of adjacent occupancies.			
V SHOP			
1. Floor area not exceeding 250 sq. m per floor built as separate compartments			
Building less than 4½ storeys or 15 m	---	---	---
Combination of ground floor shop and/or residential and/or office on upper floors	---	---	---
2. Single Storey			
(a) Less than 750 sq. m	---	---	---
(b) 750 - 1 000 sq. m	G	2	a
(c) 1 000 - 2 000 sq. m	G	1 & 2	a
(d) 2 000 sq. m and over	AG	2	a
3. Two Storeys (Total Floor Area)			
Less than 750 sq. m	G	---	a
750 - 1 000 sq. m	G	2	a
1 000 - 2 000 sq. m	G	1 & 2	a
2 000 sq. m and over	AG	2	c
3 storeys and above			
Less than 1 000 sq. m	G	2	a
1 000 - 3 000 sq. m	G	1 & 2	a
3 000 sq. m and over	AG	2	c
4. Combined shop and hotel occupancy and combined office and shop occupancies	Gross area calculated against the highest risk requirement.		
VI FACTORY			
1. Single Storey			
(a) Less than 750 sq. m	---	---	---
(b) Exceeding 750 sq. m	G	2	---
2. Open design (unenclosed)			
(a) Steel or metal fabrication works, engineering or metal works or similar low fire risk establishments	---	---	---
(b) Sawmill	GH	2	---
(c) Steel mills	H	2	---
3. Two Storeys Each floor built as separate compartment single or terrace type construction.			
(a) Each floor are less than 500 sq. m	G	---	---

(b) Each floor area 500 - 750 sq. m	G	2	a
(c) Each floor area exceeding 750 sq. m but less than 1 000 sq. m	G	1 & 2	a
(d) exceeding 1 000 sq. m per floor area	AG	1 & 2	a
4. Flatted Factories Block Development Open Balcony Approach			
(a) 2 storeys and over			
(i) Less than 750 sq. m per compartment	G	2	a
(ii) 750 - 1 000 sq. m per compartment	G	1 & 2	a
(iii) 1 000 sq. m but less than 2 500 sq. m per compartment	HG	1 & 2	c
(iv) Compartment exceeding 7 000 cu. m	AG	2	c
(b) Three storeys to 5 storeys	HG	1 & 2	c
With any compartment size exceeding 7 000 cu. m	AG	2	c
(c) 6 storeys and over	AG	2	c
5. Special Structures			
(a) Factory complexes such as palm oil mill complex, palm oil refinery, sugar mills, cement works	HG	2	c
(b) Wet processes	G	2	c
Hazardous processes	A, B, C, D, E or F	2	a

NOTE:

1. Factories in operation after hours of darkness shall be required to provide emergency lighting as required by the Fire Services Department.

2. Special risks or hazardous processes or storage shall be required to provide fire protection requirements as required by Fire Department.

3. The wall shall be returned in 100 millimetres solid masonary construction for not less than 1 metre between walls separating staircase and wall separating each unit along the balcony approach and not less than 0.5 metre along wall separating each unit and the exterior wall.

Occupancy Hazard	*Extinguishing System Note 2*	*Fire Alarm System Note 3*	*Emergency Lighting Note 4*
VII PLACE OF ASSEMBLY			
1. Class A and B below the level of exit discharge	A & G	2	b
2. Stage with fly gallaries gridirons and riggings for moveable theatre-type scenery	A & G	2	b
3. Hazardous areas	A, B, C, D, E or F	---	a
VIII STORAGE AND GENERAL			
1. Special Structures			
Open car-parks above ground	G	2	a
4 storeys and below	H & G	2	a
5 storeys and over	H & G	2	a
Automated multi level car parks	---	2	a
2. Storage incidental to Industrial processes Materials			
Classified non-combustible such as clay and bleaching earth	---	---	---
Steel rods, steel plates	---	---	---
Gypsum etc.	---	---	---
3. General			
(a) Single storey			
(i) Timber yard (open sided)	G & H	2	---
(ii) Less than 250 sq. m	---	---	---
250 - 500 sq. m	G	2	---
1 400 - 7 000 cu. m	H & G	1 & 2	a
More than 7 000 cu. m	A & G	2	a
(b) Two storeys and over			
(i) Less than 500 sq. m total area	G	2	---
(ii) 500 - 1 000 sq. m total area	H & G	1 & 2	a
1 000 sq. m and over	A & G	2	a

NOTE:

The hazardous areas and processes within any building referred to in Group VI are the following areas:

(a) Boiler Room and Associated Fuel Storage spaces.

(b) Laundries.

(c) Repair Shops.

(d) Rooms or spaces used for storage of materials in quantities deemed hazardous.

(e) Kitchen.

(f) Soiled Linen Room.

(g) Transformers and substations.

(h) Plant Room.

(i) Flammable liquid processing or refining operations.

(j) Indoor Storage of flammable liquids.

(k) Chemical plants, solvent extraction plants, distillation plants, refineries.

(l) Process equipment, pump rooms, open tanks, dip-tanks, mixing tanks.

NOTE 2:

The letters in the second column of this Schedule refer to the types of fixed extinguishing systems, as follows:

A - Automatic Sprinklers.

B - Water Spray System.

C - High Expansion Foam System.

D - Carbon dioxide system.

E - Approved Halogenated Extinguishing System.

F - Other Automatic Extinguishing System.

G - Hose Reel.

H - Hydrant System.

NOTE 3:

The figures in the third column of this Schedule refer to the types of fire alarm, as follows ---

1. Automatic Fire Detectors System.

2. Manual Electrical Fire Alarm System.

3. Signal Indicator Alarm System.

4. Manual Alarm System.

NOTE 4:

Types of Emergency Illumination---

(a) Signal point units.

(b) Central Battery.

(c) Generators.

In all cases the duration of emergency illumination in the event of failure of normal supply shall not be less than 1 hour.

NOTE 5:

Measurements of heights shall be taken from the level of the highest point of fire appliance access.

WATER STORAGE CAPACITY
(By-law 247 (1))

1. MINIMUM QUANTITY OF WATER STORAGE REQUIRED FOR HOSE REEL AND FIRE HYDRANT INSTALLATIONS IN BUILDINGS

Floor Area of the largest floor	Water storage required
Not exceeding 232.25 sq. m	9100 litre
Over 232.25 sq. m but not exceeding 464.5 sq. m	18200 litre
Over 464.5 sq. m but not exceeding 929 sq. m	27300 litre
Over 929 sq. m	36400 litre

2. MINIMUM QUANTITY OF WATER STORAGE REQUIRED FOR HOSE REEL SYSTEM ONLY

Minimum storage required for the first hose reel	2275 litre
For each additional hose reel	1137.5 litre up to a maximum of 9100 litre

3. MINIMUM QUANTITY OF WATER STORAGE REQUIRED FOR WET RISER AND HYDRANT INSTALLATIONS

(a) Break tank capacity	11375 litre
(b) Main tank capacity:	
For 455 litre per min in-coming automatic supply	45500 litre
For 1 365 litre per min in-coming automatic supply	11375 litre

FORM A

APPLICATION AND CERTIFICATION FORM FOR AUTOMATIC SPRINKLER INSTALLATION

(By-law 245 (3))

.....19.....

To the Local Authority,
.....

I (name of submitting person)..... I/C No..... of ..... apply for approval to *install/supervise the installation of an automatic sprinkler *installation/s, *extension/s which I have designed in accordance with the current FOC Rules for Automatic Sprinklers Installation for:

Name of Owner..... address of protected premises.....

Building Protected	Hazard Class	Installation Reference No.	Number of Sprinkler Heads

The proposed *installation/s, *extension/s are as detailed in the schedule above and are in accordance with the following drawings:

Drawing Ref. No.	Description of Drawing

The other relevant particulars of the *installation/s, extension/s are as given below:

EXTRA HIGH HAZARD AREAS

..... High piled storage (if any), (type, height and location) ..... The maximum number of sprinklers in any one separate risk (as defined in the F.O.C Rules for Automatic Sprinklers Installation) is .....(building ..... Installation Ref. No: .....)

WATER SUPPLY

The following water supply *will be/has been provided:

1. Water Works Mains	Diameter .....millimetres
2. Elevated Private Reservoir	Capacity .....cubic metres
3. Low Level Storage Tank/s	Capacity .....cubic metres
4. Pump/s	Motive power .....
	Nominal rating .....
	Dm^3/minute

5. Pressure Tank	.....Bars..... Drawing water from ..... Total capacity .....Cubic metres Ratio--air to water ..... Required air pressure (taking into account any losses referred to below) .....Bars

.....
Signature of submitting person

Name .....
Address .....

FOR OFFICIAL USE ONLY

Application received on .....

Application approved on .....

.....
Signature of approving person

CERTIFICATE ON COMPLETION --- to be completed and returned to the local authority by the person who submitted the application in the first instance.

I certify that the supplies detailed above have been tested in accordance with the procedures laid down in F.O.C Rules for Automatic Sprinkler Installation and at the date of test *met/did not meet the minimum requirements for the particular Hazard Classes. Particulars are as set out in the attached Test Data Sheet.

The pressure losses under the blow conditions for the respective Hazard Clauses in the pipe-work and fitting, back pressure valves and alarm valves, between the pump or pressure tank and the various installation pressure gauge (Gauge "C") are calculated to be as follows:

Installation Reference No.	Pressure losses in **Bars
No:	
No:	
No:	

Date .....

.....
Signature of submitting person

** Including the pipe-work, fittings and back pressure and alarm valves.
* Delete which is not applicable.

WATER SUPPLIES TEST DATA SHEET

(To accompany Form A when applying for approval of completed automatic sprinkler installation)

Name of Owner .....

Premises of Protected .....

Date of completion of Tests .....

TEST APPARATUS:

The test apparatus used in connection with the under-mentioned tests conform with the requirements for proving of water supplies set out in F.O.C Rules for Automatic Sprinkler Installations.

"Standard Test Orifices" for Periodic check Test of Ordinary Hazard Systems.

TEST .....Installation Ref. No ....."K" factor .....

Installation Reference No.	Water Supply	Hazard Class	Test Requirements		Installation gauge reading (bars)			*Static loss (bars) between Inst. gauge and highest sprinkler in particular Hazard Class area
			Flow dm^3/mm	Pressure Bars	*(a)* Under test conditions	*(b)* With drain valve fully open	*(c)* After test completed (standing pressure)	

*Where an installation comprises more than one Hazard Class, the loss to be stated shall be that between the installation gauge and the highest sprinkler in the particular Hazard Class.

.....

Signature of submitting person

Date .....

FORM B

APPLICATION AND CERTIFICATION FORM FOR FIXED INSTALLATIONS AND FIRE ALARM SYSTEMS

(By-law 245 (3), 246)

.....19.....

To the Local Authority,

.....

I (name of submitting person)..... apply for approval to *install/supervise the installation of the *fixed installations/fire alarm system as described hereunder and as shown on the drawings submitted with this application which I have designed in accordance with the current F.O.C Rules/BSCP/British Standard No. .....
Name of Owner .....

Address of premises of installation/s .....

Type and nature of *installation/s: Fire Alarm System
Wet Riser
Dry Riser
Hose Reel
Other Fixed Installation

Buildings Protected .....

Number of Risers (Wet/Dry*) .....

Number of pumping inlets .....

Number of landing valves .....

Number of Fire Alarm call points .....

Number of indicator panels .....

Location .....

Fire Station link to .....

Secondary Power Supply .....

Water Supply : The following water supply have been provided:

Number of Fire Hydrants .....Position/s .....Minimum Flow/dm^3pm.....

Waterworks Main/Rising Main ..... Diameter .....mm

Private Reservoir (Type) ..... Capacity .....m^3

Rate of discharge/replenishment by waterworks mains .....

Pump Motive power ..... Nominal Rating .....dm^3/hr.....

Bars .....Drawing water from .....

Comments (if any) and departures from the BSCP/FOC/British Standards/CIFS Regulations
.....

.....
Signature of submitting person

FOR OFFICIAL USE ONLY:

Date Received .....
Date Approved .....

I certify that the *Fixed Installations/Fire Alarm System as described in the Form of Application and as shown on the approved drawings have been completed under my personal supervision and have been tested to my satisfaction and as such I would apply for your endorsement for issue of a completion certificate.

.....
Signature of submitting person

Date .....

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* Delete which is not applicable.

Made on the 198
[KPKT. (S) 01/1108/1; PN. (PU^2) 252 Pt. III.]

.....
Minister for Federal Authority/State Authority