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Corrected by RGN 125

Amended by (1) 146/81
(2) 271/81
(5) 310/85

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MODEL BUILDING BY-LAWS, 1978

DEPARTURE NOTICES:
SI 547/79
GN 149/81

ADOPTED BY:-
HARARE RGN 363/71
SI 472/79
345/85
23/2001
BYO SI 332/80
MUTARE SI 204/86
KADOMA SI 474/79

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SI. 41 of 1978
Corrected by SI 125/78

(1) 146/80
(2) 271/87
(5) 310/85
(6) 37/16

ARRANGEMENT OF CHAPTERS

Given to Tashinga 8/1/14

Chapter

Given to Ti Manono 30/10/14

IN terms of section 183 of the Urban Councils Act [*Chapter 214*] as read with section 83A of the Rural Councils Act [*Chapter 211*], the Minister of Local Government and Housing hereby publishes the following model building by-laws:

19/10/13

Adv. J.C.J. LEWIS
NOTARY PUBLIC
COMMISSIONER OF OATHS

THE LABOUR SOLUTIONS CONFERENCE

21st MARCH 2013 ~ RAINBOW TOWERS HOTEL

Organised by Human Resources (Pvt) Ltd

CHAIRMAN'S WELCOME

Welcome ladies and gentlemen to the Labour Solutions Conference. Although at least 5 of speakers will be referring frequently to labour law, I emphasize that this event is about SOLUTIONS. Pre-empting the problem in the first place will be a solution for many businesses with histories of labour unrest.

When a serious dispute occurs it is often the habit of all parties to identify the key issue in a dispute as the cause of the problem eg. "insufficient pay." On reflection, however, it is clear that many variables ("causes") contribute to a management/labour dispute. Top Economist John Robertson will, in his paper, illustrate and explain the complex economic context of our tiny, 800 000 formal sector. At the economic level there are many interacting variables of importance for us to understand. Moving to the individual level of possible causes, Peter Drucker's observation is that *"All labour/management disputes are the outcomes of failures in negotiation in the earlier stages."*

In this event we will approach labour solutions from the micro level – negotiating skills, reading body language, listening, preparing, etc and from the macro economic levels of national competence and potential for economic growth. In between we have a team of experienced practitioners who will offer the benefits of both the practical experiences in the courts and arbitration as well as the guidelines therefrom which will assist managements towards "solution by pre-emption."

Venue

Although we booked the Jacaranda Rooms for this event about a year ago the hotel has commandeered those rooms. We found ourselves allocated to the much smaller Topaz Room and adjusted our marketing accordingly. Yesterday, the hotel offered this room, and we accepted, for the greater comfort and convenience of participants. At the time of writing this, the Hotel has not advised us of the lunch arrangement. I assure you that when negotiations for this have been concluded we will find ourselves with an even better lunch than our high

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PRELIMINARY

NATURE OF CHAPTER 1

1. The provisions of this chapter are not intended to have any legal force and effect, but may be regarded as constituting—

(a) a guide to some of the other legislation relating to the Model Building By-laws, 1977; and

(b) a guide to the Model Building By-laws, 1977, as a whole; and

(c) an aid to the construction and interpretation of the Model Building By-laws, 1977.

PART I

PROVISIONS IN ACTS WHICH ARE RELEVANT TO THE APPLICATION OF THESE BY-LAWS

DEFINITIONS IN THE URBAN COUNCILS ACT [*Chapter 214*]

2. The following terms are defined in the Urban Councils Act [*Chapter 214*] in the manner here indicated, and such terms have the meaning so indicated throughout these by-laws, whether these by-laws are adopted by an urban council or a rural council—

"combined private sewer" means a sewer, exclusive of soil-pipes, waste-pipes and vent-pipes, for the purpose of conveying to a public sewer or a conserving-tank or other receptacle the sewage from two or more private sewers, and includes all other things necessary in connexion therewith;

"conserving-tank" means any covered tank without overflow which—

(a) is used for the reception and temporary retention of sewage; and

(b) requires emptying at intervals;

"construction", in relation to a building, includes the alteration, subdivision, conversion or reconstruction of, or the addition to, a building;

"private drain" means a conduit for the conveyance of storm-water or any surface, subsoil or spring water from one premises to a public drain;

"private sewer" means a sewer, exclusive of waste-pipes, soil-pipes and vent-pipes, for the purpose of conveying to a combined private sewer, a public sewer or a conserving-tank or other receptacle the sewage from one premises, and includes all other things necessary in connexion therewith;

"public drain" means a conduit vested in or under the control of or used by a municipality or town for the conveyance of storm-water or any surface, subsoil or spring water, and includes all other things necessary in connexion therewith;

"public sewer" means a sewer vested in or under the control of or used by a municipality or town into which is discharged or intended to be discharged the sewage from private sewers or combined private sewers, and includes pipes, manholes, chambers, ventilating shafts, ejectors, sluices and all other things necessary in connexion therewith;

"sanitary fitting" means any water-closet, urinal, bidet, slopsink, bath, wash-basin, sink, shower or other fitting of a like nature from which soil-water or waste water is disposed of into a soil-pipe or waste-pipe, as the case may be;

"sewage" includes trade effluent;

"sewage works" includes reservoirs, tanks, strainers, filter-beds, ponds, engines, pumps, machinery, buildings, lands and all other works and things, except public sewers, which are necessary for the treatment and disposal of sewage;

"storm-water" means all flow of water directly due to rainfall before such water joins a public stream;

"trade effluent" means any liquid, with or without particles of matter suspended therein, which is produced either wholly or in part or results from or has been or was intended to be used in any trade or business or commercial, manufacturing or industrial process;

"water-main" includes any conduit, pipeline, valve, valve-chamber, meter, meter-chamber or house, break-pressure tank, scour-pipe or scour-chamber which—

(a) is vested in, under the control of or used by a municipality or town; and

(b) is used for the conveyance and control of water supplied by the municipality or town;

and includes all other things necessary in connexion therewith.

DELEGATION OF AUTHORITY

3. Attention is drawn to section 93 of the Urban Councils Act [*Chapter 214*] and to section 137 of the Rural Councils Act [*Chapter 211*] which enable local authorities to delegate many of their powers to employees in the following terms—

Section 93 of the Urban Councils Act [Chapter 214]

93. (1) A council or an executive committee, with the approval of the council, may delegate, subject to such conditions as it may impose, to an employee of the council such of the powers vested in it by or under this Act or any other law as it considers to be necessary or desirable and may in like manner amend or withdraw any such delegation:

Provided that—

(i) the council or executive committee shall not delegate to an employee the powers conferred by any Act, other than this Act, or any statutory instrument made under such other Act upon the council, unless the proposed delegation has been approved by the appropriate Minister responsible for the administration of the Act concerned in its application to the council area and any conditions fixed by that Minister in granting his approval are complied with;

(ii) the council shall not delegate to an employee any powers which it has delegated to the executive committee;

(iii) the council or executive committee shall not delegate to an employee any power conferred by model building by-laws which have been adopted by or on behalf of the council, to grant a relaxation or waiver referred to in subparagraph (2) of paragraph 43 of the Third Schedule, unless the by-law concerned expressly provides that the power may be delegated to such employee;

(iv) no powers specified in subsection (2) of section *sixty-seven* or in subsection (2) shall be delegated to an employee;

(v) the amendment or withdrawal of any delegation shall not invalidate anything done in pursuance of a decision lawfully taken by the employee before the date of such amendment or withdrawal.

(2) Any person who feels aggrieved by a decision of an employee acting under powers delegated to him in terms of subsection (1) shall have the right to bring the matter in writing to the attention of the appropriate head of department in the first instance and, failing satisfaction, to the council through the town clerk for examination.

(3) The delegation in terms of subsection (1) of any powers to an employee shall not preclude the council or executive committee, as the case may be, from itself exercising the powers so delegated and the council or executive committee may amend or rescind any decision of an employee in the exercise of the powers so delegated to him.

Section 137 of the Rural Councils Act [Chapter 211]

137. The council may by resolution delegate, either absolutely or conditionally, to such officers or servants as may be specified in such resolution any powers of the council except the powers to make by-laws, levy any impost, fix any charge or tariff or borrow any money.

FIXING OF CHARGES

4. Attention is drawn to section 172 of the Urban Councils Act [*Chapter 214*] and to section 79 of the Rural Councils Act [*Chapter 211*] which enable local authorities to fix and levy charges by resolution in the following terms—

Section 172 of the Urban Councils Act [Chapter 214]

172. (1) A council may, by resolution passed by a majority of the total membership of the council—

(a) fix tariffs or charges for—

(i) the supply of electricity or water or of refuse removal services; or

(ii) the conveyance of sewage or trade effluent in public sewers and its treatment at a sewage treatment works; or

(iii) any other services which a council may provide in terms of this Act;

(b) fix charges to be payable in respect of certificates, licences or permits issued, inspections carried out, services rendered or any act, matter or thing done by the council in terms of this Act;

(c) fix deposits to be paid in connexion with any services provided by the council in terms of this Act.

(2) Before any tariffs, charges or deposits fixed in terms of subsection (1) come into operation—

(a) a statement setting out the proposed tariffs, charges or deposits and any existing tariffs, charges or deposits for the same matters shall—

(i) be advertised in two issues of a newspaper; and

(ii) be posted at the office of the council for a period of not less than thirty days from the date of the first advertisement in the newspaper;

and

(b) if the tariff relates to charges for the supply of electricity, a statement setting out the proposed tariffs shall be submitted to the Electricity Council constituted in terms of the Electricity Act [*Chapter 282*].

(3) If a statement has been—

(a) advertised in terms of paragraph (a) of subsection (2) and within the period of thirty days referred to in that paragraph objections to the proposed tariffs, charges or deposits are lodged—

(i) by thirty or more persons who are voters or who are users of the service to which the tariff, charge or deposit relates; or

(ii) where there are less than thirty such users of the service concerned, by not less than fifty *per centum* of the number of such users;

such tariffs, charges or deposits shall be reconsidered by the council, together with the objections so lodged, and they shall not come into operation unless the resolution is again passed by a majority of the total membership of the council;

(b) submitted to the Electricity Council in terms of paragraph (b) of subsection (2) and, within a period of sixty days from the date it is so submitted, the Electricity Council lodges any objection to the proposed tariff, that proposed tariff shall not come into operation unless the Minister consents thereto.

(4) The notice to councillors of any meeting at which the proposed tariffs, charges or deposits are to be reconsidered for the purposes of subsection (3) shall contain a copy of all objections lodged in terms of paragraph (a) of subsection (3).

(5) A resolution in terms of this section relating to any tariffs, charges or deposits which are provided for in any by-law shall not have the effect of introducing new tariffs, charges or deposits until the by-law concerned has been repealed or amended, as the case may be:

Provided that the provisions of this subsection shall not apply in relation to the introduction of a special water tariff which is introduced to have effect during a period of a water shortage.

Section 79 of the Rural Councils Act [Chapter 211]

79. (1) A council may, by resolution passed by a majority of the whole number of the councillors thereof, levy charges for services rendered, registration certificates or licences issued, inspections carried out or any other matter for which by-laws may be made in terms of the Third Schedule.

(2) Before any such charges come into operation, a statement setting out the proposed charges and any existing charges for the same matters shall, for a period of not less than thirty days, be posted in the manner in which notices are usually posted in the council area and published in a newspaper circulating in the neighbourhood.

(3) If, during the said period of thirty days, thirty or more voters lodge objections to the proposed charges, such charges shall be reconsidered by the council together with such objections and shall not come into operation unless passed by a majority of the whole number of the councillors thereof. The notice to councillors of any meeting at which such charges are to be so reconsidered shall contain a copy of such objections.

(4) Where such charges are in respect of a designated area, they shall—

(a) be considered by the town board prior to the publication in terms of subsection (2); and

(b) if there are any objections thereto lodged in terms of subsection (3), be reconsidered by the town board together with such objections; and

(c) be recommended to the council if passed by a majority of the whole number of councillors for the town board following such consideration and, as the case may be, reconsideration;

and on receipt of such recommendation the council shall be deemed to have passed in terms of subsection (1) a resolution to levy such charges for such designated area in accordance with such recommendation.

(5) No resolution made in terms of this section varying any charges which are provided in any by-law shall come into effect until such by-law has been repealed.

RIGHT OF ENTRY

5. Attention is drawn to section 173 of the Urban Councils Act [*Chapter 214*] and to section 71 of the Rural Councils Act [*Chapter* 211] which authorize the local authorities, their officers, employees and contractors to go on to land and to enter premises in the following terms—

Section 173 of the Urban Councils Act [Chapter 214]

173. (1) Subject to the provisions of this section, a council—

(a) may place any water main, public drain, electricity transmission line or public sewer, together with any works necessary to and used in connexion with such water main, public drain, electricity transmission line or public sewer, whether above or below ground, into, out of, along or across any land, including any road, other than land covered by buildings, whether such land is within or outside the council area; and

(b) shall, through its employees or contractors, together with any assistants and advisers that may be necessary, have access to or over any property by the shortest and most practicable route reasonable in the circumstances for the purposes of—

(i) doing anything authorized or required to be done by the council in terms of this Act or any other law, including the placing of any water main, public drain, electricity transmission line or public sewer in terms of paragraph (a);

(ii) inspecting, examining, testing, repairing, renewing, maintaining and cleaning any property of the council, including any water main, public drain, electricity transmission line or public sewer;

(iii) inquiring into and investigating the suitability of immovable property for any work, scheme or undertaking of the council, and in making any necessary survey or valuation in connexion therewith;

(iv) ascertaining whether—

A. there exists any nuisance; or

B. there is or has been a contravention of the provisions of this Act or any other law, responsibility for the administration of which is vested in the council;

(v) ensuring compliance with the provisions of this Act or any other law, responsibility for the administration of which is vested in the council.

(2) The exercise by the council of any of the powers referred to in subsection (1) shall be subject to the provisions of this Act and of any other law regulating or controlling the rights of the council in that regard.

(3) Where it is proposed that the powers referred to in subsection (1) should be exercised over or under any road which is not vested in or maintained by the council, the council, before commencing any such work, shall consult the appropriate road authority as defined in the Roads and Road Traffic Act [*Chapter 263*] and shall comply with any reasonable requirements of that road authority.

(4) Before exercising any powers referred to in subsection (1) the council shall give reasonable notice—

(a) to the owner or occupier of the property concerned of the intention to enter into or upon any building or land by notifying the occupier personally or by post or by giving notice to the owner at his last usual or last known place of abode or business personally or by post:

Provided that, in the case of work which is required to be executed urgently, any matter affecting public health which is urgent, or the reading of meters, it shall not be necessary for the council to give the notice required by this subsection;

(b) in the case of land within the area of another local authority, to that other local authority.

(5) No person shall be subjected to entry of his dwelling-house without his consent, except at reasonable times and to the extent that such entry is necessary—

(a) for matters referred to in the proviso to paragraph (a) of subsection (4); or

(b) in the interests of town and country planning; or

(c) for the purpose of the valuation of the dwelling-house in connexion with any rate; or

(d) to enable the council to carry out work connected with any of its property which is lawfully in that dwelling-house.

(6) A person who is authorized in terms of this section to enter any land may take with him such persons, animals, vehicles, appliances and other things as he may consider necessary for the performance of his duties.

(7) Upon the completion of any works performed in the exercise of the powers conferred by this section on the property of any person, the council shall promptly restore the surface of the land, road or other place upon which the work was carried out as nearly as reasonably possible to the same condition as it was before the commencement of the work, and in carrying out the work the council shall do as little damage as reasonably possible to such land, road or other place.

(8) The council shall pay compensation to any person who suffers loss or deprivation of rights by the exercise of the powers conferred by this section and the provisions of Parts I and IV of the Land Acquisition Act [*Chapter 144*] shall, *mutatis mutandis*, apply to the payment of such compensation:

Provided that any reference in Part IV of that Act to the date of the publication of a preliminary notice in the *Gazette* shall be read and construed as a reference to the date of the exercise of the powers referred to in this subsection.

Section 71 of the Rural Councils Act [Chapter 211]

71. Any officer or other employee of the council duly authorized for the purpose by the council may at all reasonable times enter any premises within the area of the council for the purpose of any inspection or inquiry, or the execution of any duty, carried out in terms of this Act:

Provided that no such entry may be made into a dwelling-house unless it is necessary—

(a) for the enforcement of this Act where there are reasonable grounds to suspect that an offence against this Act has been, is being, or is about to be committed in such dwelling-house, or that a person who has committed such an offence, or evidence relating to such an offence, is to be found therein; or

(b) otherwise in the interests of public health or public safety; or

(c) to enable the council to carry out work connected with any property of the council which is lawfully in such dwelling-house; or

(d) for the purpose of the valuation of such dwelling-house in connexion with any impost levied or to be levied in terms of this Act.

OFFENCES AND PENALTIES

6. Attention is drawn to sections 266 and 267 of the Urban Councils Act [*Chapter 214*] and to sections 142 and 143 of the Rural Councils Act [*Chapter 211*] which prescribe offences and penalties which, consequent upon the definition of "this Act" in subsection (1) of section 3 of the Interpretation Act [*Chapter* 1], apply not only to the relevant Acts, but also to all by-laws made in terms of those Acts.

Sections 266 and 267 of the Urban Councils Act, [*Chapter 214*]

266. Where—

(a) any matter or thing is, by or in terms of this Act or any order or notice made or given under the authority thereof, directed or forbidden to be done; or

(b) any authority is given by or in terms of this Act to a council or any person to direct any matter or thing to be done or to forbid any matter or thing to be done;

and such act so directed to be done remains undone, or such act so forbidden to be done is done, then in every such case every person so offending against such direction or prohibition shall be guilty of an offence.

267. (1) Any person who is guilty of an offence in terms of this Act, where no penalty is expressly provided therefor, or of any regulation or by-law made under this Act shall be liable for each such offence—

(a) to a fine not exceeding two hundred dollars; or

(b) in the case of a continuing offence, to a fine not exceeding two hundred dollars or, if the offence has continued for more than fifty days, to a fine not exceeding four dollars for each day during which the offence has continued.

(2) A conviction for an offence referred to in subsection (1) shall not be a bar to further prosecution or prosecutions for a continuation of the offence.

Sections 142 and 143 of the Rural Councils Act [*Chapter 211*]

142. Where—

(a) any matter or thing is by this Act or by any order or notice made and published under the authority thereof directed or forbidden to be done; or

(b) any authority is given by this Act to any person to direct or request any matter or thing to be done, or to forbid any matter or thing to be done;

and such act so directed or requested to be done remains undone, or such act so forbidden to be done is done, then in every such case every person so offending against such direction or prohibition shall be guilty of an offence.

143. (1) Any person guilty of an offence in terms of this Act shall, unless other provision is made in this Act, be liable for every offence to a fine not exceeding one hundred dollars or, in the case of a continuing offence, a fine not exceeding four dollars for every day during which the offence continues.

(2) On the conviction of any person of any offence such as is referred to in subsection (1) the court may, on the application of the council or the prosecutor acting on the instructions of the council and in addition to any other penalty which it may impose, give summary judgement in favour of the council for an amount not exceeding the amount of any loss caused to the council by the commission of the offence, and such judgement shall have the same force and effect and be executed in the same manner as if it had been given in a civil action duly instituted in the said court:

Provided that nothing in this subsection shall be deemed to affect the jurisdiction of the said court conferred by any other law.

(3) On the hearing of any application made in terms of subsection (2) the court may refer to the proceedings and evidence at the trial and may hear such further evidence as may be tendered by the prosecutor and the person convicted.

SERVICE OF NOTICES AND ORDERS

7. Attention is drawn to section 34 of the Interpretation Act [*Chapter 1*], which provides for the manner in which all notices and orders referred to in these model by-laws may be served—

Section 34 of the Interpretation Act [Chapter 1]

34. (1) Where an enactment authorizes or requires a document to be served by post, and where the word "serve" or any of the words "give", "deliver" or "send" or any other word is used, the service of the document may be effected by prepaying, registering and posting an envelope addressed to the person on whom the document is to be served at his usual or last-known place of abode or business, and containing such document, and, unless the contrary is proved, the document shall be deemed to have been served at the time at which such envelope would have been delivered in the ordinary course of post.

(2) Where an enactment authorizes or requires a document to be served on any person without directing it to be served in a particular manner, the service of that document may be effected either—

(a) by personal service;

(b) by post in accordance with subsection (1);

(c) by leaving it for him with some person apparently over the age of sixteen years at his usual or last-known place of abode or business;

(d) in the case of a corporate body, or an association of persons whether incorporated or not, by delivering it to a director, the secretary or clerk of the body or association at the registered or principal office of the body or association, or serving it by post on such director, secretary or clerk at such office; or

(e) if it is not practicable, after reasonable inquiry, to discover the name or address of an owner, lessee or occupier of premises on whom the document should be served, by addressing the document to him by the description of owner or lessee or occupier of the premises (naming them) to which the document refers and by delivering it to some person on the premises or, if there is no person on the premises to whom it can be delivered, by affixing it, or a copy of it, to some conspicuous part of the premises.

PROTECTION OF PUBLIC SEWERS AND DRAINS

8. Attention is drawn to section 128 of the Urban Councils Act [*Chapter 214*] which deals with the protection of public sewers and public drains. This section is published in this chapter for guidance purposes and in the case of any doubt the local authority should be consulted.

Section 128 of the Urban Councils Act [Chapter 214]

128. (1) No person shall, except with the consent of the council and subject to such conditions as it may impose—

(a) construct any building or other structure over a public sewer or public drain or in such a position or in such a manner as to be likely to interfere with or endanger a public sewer or public drain; or

(b) excavate, open up or remove the ground above, next to, under or near a public sewer or public drain; or

(c) discharge or put into or permit to enter a public sewer or public drain any solid, liquid or gaseous substance which the council, by notice in writing to the person concerned, has prohibited from being discharged into that sewer or drain on the grounds that it is likely to injure or damage that sewer or drain, interfere with the free flow of sewage or storm-water or cause a nuisance or involve danger to the health of persons entering that sewer or drain or employed at the sewage works or to endanger, destroy or be injurious to the structure of any public sewer, public drain, sewage works or land or to the processes used therein or thereon; or

(d) discharge or put into or permit to enter a public sewer any storm-water; or

(e) discharge or put into or permit to enter a public drain any sewage; or

(f) make any opening into a public sewer or public drain; or

(g) take any action which might injure, endanger or destroy a public sewer or public drain.

(2) The council may—

(a) demolish, alter or otherwise deal with any building or other structure constructed in contravention of the provisions of subsection (1);

(b) fill in or make good any ground excavated or removed in contravention of the provisions of subsection (1);

(c) repair and make good any damage done in contravention of, or occasioned as a result of a contravention of, the provisions of subsection (1);

(d) remove anything discharged or put into a public sewer or public drain in contravention of the provisions of subsection (1) or which is injuring or endangering or likely to injure or endanger or destroy the public sewer or public drain;

and recover the expenses incurred by the council from the person guilty of such contravention.

(3) Where any person discharges or puts into or permits to enter a public sewer or public drain any solid, liquid or gaseous substance which is prohibited in by-laws, the council may recover the expenses incurred in—

(a) removing; and

(b) repairing and making good any damage done by; anything so discharged or put into or permitted to enter a public sewer or public drain.

CONFLICT BETWEEN THESE BY-LAWS AND OTHER BY-LAWS

9. Attention is drawn to subsection (10) of section 183 of the Urban Councils Act [*Chapter 214*] setting out the legal position where there is any conflict or inconsistency between these by-laws and other by-laws.

Subsection (10) of section 183 of the Urban Councils Act [Chapter 214]

(10) Where model building by-laws are in force in any council area and there is any conflict or inconsistency between any provision of the model building by-laws as applied and any other by-laws of the council in force in that area, the provision of the model building by-laws as applied shall prevail.

PART II

GUIDE TO MODEL BUILDING BY-LAWS AS A WHOLE

EFFECT OF CHAPTERS

10. (1) The administrative provisions of Chapter 2 have general application to—

(a) the construction of all buildings, alterations and additions; and

(b) the installation and modification of all aspects of the sewerage system on any land, other than those parts of the sewerage system which are the responsibility of the local authority.

(2) Chapter 3 and the subsequent chapters are primarily concerned with providing technical information on the standards to which building and sewerage work shall be undertaken, but some of these chapters also contain certain administrative provisions creating continuing obligations specifically associated with the subject-matter of the relevant chapter.

(3) The provisions of these by-laws do not cover all administrative matters associated with building and sewerage work, and each local authority is likely to have further by-laws which it has made or adopted concerning, *inter alia*—

(a) applications for and the supply of water;

(b) applications for connexions to public sewers and the making of such connexions;

(c) the provision of fire-protection services;

(d) the licensing of advertising signs.

FORCE AND EFFECT: ADOPTION

11. The Model Building By-laws, 1977, shall have force and effect within the areas under the jurisdiction of the various local authorities in Rhodesia only as and when they are adopted by or on behalf of each local authority, whereupon the Model Building By-laws, 1977, will become operative within the area under the jurisdiction of each such local authority.

VARIATIONS

12. (1) Throughout the course of these model building by-laws, local authorities are given the power to allow departures or relaxation in respect of specified situations, and local authorities have the discretion to interpret provisions incorporating the terms "adequate", "proper", "reasonable", "satisfactory" and similar terms in a manner reflecting the local authority's own appreciation of the circumstances.

(2) In all other cases, however, departures or variations from these model building by-laws must be authorized in terms of Part VII of Chapter 2, or await the adoption of amendments to these model building by-laws.

RESPONSIBILITY FOR BUILDING AND SEWERAGE WORK

13. (1) The fact that a local authority may have approved, with or without tests, plans, excavations, foundations, the construction of structural members or any other aspect of any building or sewerage work does not, *per se*, exonerate the owner, builder or plumber from all liability in respect of such work.

(2) The owner, builder or plumber remains responsible in all circumstances for complying with the provisions of these model building by-laws, as adopted by any local authority.

(3) The local authority will not be responsible for any costs or losses associated with the construction of buildings or sewerage work unless such costs or losses can be directly attributed to the wrongful or negligent acts of the local authority or its servants.

PART III

AIDS TO INTERPRETATION

DIVISION OF PROVISIONS WITHIN CHAPTERS

14. (1) Most chapters in these model building by-laws are divided, in the first instance, into Parts.

(2) Each chapter is divided, further, into sections, the numbering of the sections being in no way dependent upon the division of the chapter into Parts.

(3) Sections may be divided into subsections.

(4) Both sections and subsections may contain paragraphs, and such paragraphs may or may not be grammatically dependent upon the section or subsection in which they appear: a "paragraph" may, therefore, constitute a sentence in its own right.

(5) The Tables and Schedules are intended to constitute part of the body of the by-laws, and the provisions thereof should be observed unless the contrary is indicated.

ARRANGEMENT WITHIN CHAPTERS

15. The order in which provisions appear in the chapters, and the manner in which chapters are divided into Parts, sections, subsections and paragraphs, is intended to be of significance in interpreting these model building by-laws. Thus, "such walls" in a subsection (2) may refer to "exterior concrete-block mortar walls" in the preceding subsection.

DEFINITIONS

16. (1) The definitions set out in Chapter 2 are intended to apply throughout these by-laws.

(2) Terms which are defined in other chapters are, *prima facie*, applicable only to the chapters in which they are defined, but they may be considered as having persuasive force in construing similar terms in other chapters in which such terms are not defined.

(3) Definitions contained in standards, codes of practice and other similar rules shall be regarded as applicable throughout these by-laws unless a contrary intention is apparent.

INDEX—CHAPTER 2

CHAPTER 2

ADMINISTRATION

ARRANGEMENT OF SECTIONS

PRELIMINARY

TITLE

1. These by-laws may be cited as the Model Building By-laws, 1977.

INTERPRETATION

2. (1) In these by-laws—

"approved" means approved by the local authority or by any employee of the local authority to whom its power of approval may have been delegated in terms of these regulations or any other law;

"architect" means a person registered ~~as a member of the Architects Council of Rhodesia~~ in terms of the Architects Act, 1975 ~~[No. 35 of 1975]~~; [Chapter 27:01]

"basement" means any storey beneath the ground storey;

"builder", except in Chapter 12, means the person undertaking construction of a building or the principal parts of a building, and includes a building contractor or an owner who is undertaking the contracting, but does not include a person undertaking limited parts of the construction, including the brickwork, carpentry or painting alone;

"dwelling" means a dwelling-house or a dwelling-unit as defined in Chapter 11;

"housing project" means a project for the construction of two or more dwelling-houses or units not exceeding two storeys in height;

"invert" means, for any cross-section, the lowest portion of the inner surface of a conduit;

"Minister" means the Minister of Local Government and Housing;

"occupier" shall include any person in actual occupation of land or premises, without regard to the title under which he occupies, and, in the case of premises subdivided and let to lodgers or various tenants, shall include the person receiving the rent payable by the lodgers or tenants whether on his own account or as agent for any person entitled thereto or interested therein;

"owner", in relation to a building or a sewerage system under construction, repair or alteration, or about to be constructed, repaired or altered, means the person upon whom ultimately rests the obligation to pay for the construction, repair or alteration of such building or sewerage system;

"plans" includes drawings, sections, elevations, specifications, structural detail drawings and any application form relevant thereto;

"plumber", except in Chapter 9, means a person undertaking plumbing or sewerage work;

"prescribed fee" means the tariff, charge or deposit payable to the local authority and determined by resolution of the local authority in terms of section 172 of the Urban Councils Act [*Chapter 214*], or section 79 of the Rural Councils Act [*Chapter 211*];

"sewerage system" means all pipes, traps, vents, sanitary fittings, cisterns, joints, manholes, inspection covers or any other thing which is intended or used for the disposal of soil water or waste water;

"sewerage work", except in Chapter 9, means any work on a sewerage system, and includes any work on drains and any plumbing work which may be done in conjunction with any building work or sewerage work;

"site" means the stand, lot, plot or surveyed or otherwise demarcated or limited area of land upon which a building is being constructed or sewerage work is being undertaken;

"soil-water" means excremental liquid discharged from soil-water fittings;

"storey"—

(a) includes a basement;

(b) "first storey" means the storey immediately above the ground storey;

(c) "ground storey" means that storey of a building to which there is an entrance from the outside on or near the finished ground-level adjoining such entrance, and, in the case of more than one such storey, the lowest;

(d) "height of storey" means the average vertical distance measured from the upper surface of the floor of that storey to the underside of the ceiling of that storey, or, where there is no ceiling, to the underside of the rafters, the joists or the beams, as the case may be, above such storey;

(e) "mezzanine storey" means ~~a storey extending over only part of a building, and introduced between two other storeys~~;

(f) "topmost storey" means the uppermost storey, whether constructed wholly or

partly in the roof or not, and whether adapted for human habitation or not;

"structural engineer" means a person who is a corporate member of the Rhodesian Institution of Engineers in terms of the Rhodesian Institution of Engineers (Private) Act [*Chapter 226*] and is approved by the local authority;

"waste water" means non-excremental liquid discharged from waste-water fittings.

(2) For the purpose of these by-laws, the owner of the site upon which a building or sewerage system is being or is to be constructed, repaired or altered shall, unless he proves the contrary, be deemed to be the person on whom ultimately rests the obligation to pay for the construction, repair or alteration of such building or sewerage system.

(3) All references in these by-laws to—

(a) "C.A.S."; or

(b) "C.A.S. No."; or

(c) "S.A.B.S."; or

(d) "B.S.";

followed by a number or by a letter or letters and a number shall be construed as a reference to the appropriately numbered publication embodying a standard or a code of practice laid down in the case of paragraphs (a) and (b), by the Standards Association of Central Africa and in the case of paragraphs (c) and (d), by the South African Bureau of Standards and the British Standards Institution respectively, which publication, may be inspected free of charge at the offices of the Standards Association of Central Africa, 17, Coventry Road, Workington, Salisbury.

(4) Any amendment made to a standard or a code of practice referred to in subsection (3) shall have force and effect in these by-laws from the date of such amendment, unless the Minister, on the recommendation of the variations committee appointed in terms of section 59, does not approve the amendment and publishes a notice to this effect in the *Gazette*.

(5) When applying provisions of these by-laws which incorporate such subjective expressions as "acceptable", "adequate", "proper", "reasonable", "satisfactory" or "suitable", the local authority shall have regard to—

(a) the general nature of the standards set in these by-laws; and

(b) the nature of the specific circumstances of each case.

FEES: GENERAL PROVISIONS

3. (1) Wherever—

(a) these by-laws provide for the payment of a prescribed fee for—

(i) the approval of any plans; or

(ii) the undertaking of any inspection; or

(iii) any test;

as a condition precedent to the carrying out of any work or any further work, to the occupation or use of any building, plumbing system or sewerage system or to the taking of any action; and

(b) the local authority has fixed the amount of the prescribed fee;

the person who is required to pay the prescribed fee so fixed shall pay the fee as laid down in subsection (2).

(2) The prescribed fee specified in subsection (1) shall be paid before—

(a) the local authority is required to examine the plans, undertake the inspection or test; and

(b) such person may undertake the work or further work, occupy or use the building, plumbing system or sewerage system or take the relevant action.

REFUND OF FEES

4. If the local authority refuses to approve plans, or if, having approved plans in terms of Part I, such approval lapses in terms of section 22, or if plans are withdrawn by the applicant after approval but before commencement of the work, the local authority may refund the amount equivalent to fifty *per centum* of the fees paid by the applicant:

Provided that such refund shall not be paid unless—

(a) the total amount to be refunded exceeds ten dollars; and

(b) in the case of disapproved plans or lapsed approval, a claim for the refund is made within thirty days of—

(i) the applicant being notified that his plans have been disapproved; or

(ii) the approval having lapsed.

PART I

PLANS AND DRAWINGS

NO BUILDING OR SEWERAGE WORK TO BE UNDERTAKEN WITHOUT APPROVAL OF LOCAL AUTHORITY

5. (1) Subject to the provisions of this Chapter, no person shall commence—

(a) to construct a building; or

(b) to re-erect a building; or

(c) to undertake any sewerage work;

on any site unless and until plans have been submitted to, and approved by, the local authority in terms of these by-laws for all and every part of the work involved.

(2) Where a person wishes to obtain the approval of the local authority in terms of subsection (1), he shall—

(a) pay the prescribed fees; and

(b) make written application, in duplicate, to the local authority, on the form provided by the local authority for such application, completing the form in all relevant respects; and

(c) submit with the application form two copies of any plans which are called for in terms of these by-laws; and

(d) provide such further plans, drawings, details, particulars, specifications and other information as the local authority may reasonably require to ensure that the building or

sewerage work is undertaken in accordance with these by-laws.

(3) Approval in terms of this section shall not be required for—

(a) the maintenance, repair or redecoration of any building, plumbing system or sewerage system; or

(b) the clearing of stoppages in sewers or drains; or

(c) the provision of extra taps or branches on a water-distribution system within the boundaries on any site and on the site side of any meter or stop-cock installed by the local authority between the mains and the outlet points on the site

PLANS TO BE SUBMITTED: NEW WORK

6. (1) The plans to be submitted in terms of section 5 shall comprise—

(a) a site-plan prepared in accordance with the provisions of section 13; and

(b) a complete set of working-drawings prepared in accordance with the provisions of section 14; and

(c) plans and sections of any sewerage and drainage work to be undertaken in accordance with the provisions of section 15; and

(d) a statement of the proposed use of all the various parts of the proposed buildings; and

(e) where a structure requires stress calculations covered by any provision in Chapter 3, a certificate on the appropriate form provided by the local authority, which—

(i) is signed by the structural engineer who made or checked the calculations;

(ii) gives an assurance that such calculations were made or checked by a structural engineer; and

(iii) gives an undertaking that the carrying out of the work to which those calculations relate will be supervised by an architect or structural engineer; and

(iv) where the local authority indicates that it is required, provides for the furnishing of complete and self-explanatory structural design calculations and drawings;

and

(f) the estimated value of the work; and

(g) such particulars as may be required elsewhere in these by-laws.

(2) All plans shall be dated and signed—

(a) in the case of structural detail drawings, by the structural engineer responsible for their preparation;

(b) in all other cases, by the architect or other person responsible for their preparation.

(3) Every signature affixed to a plan in terms of subsection (2) shall be easily legible or otherwise identified, so that the local authority can readily determine whose signature it is.

NO ALTERATIONS OR ADDITIONS WITHOUT APPROVAL OF LOCAL AUTHORITY

7. (1) No person shall make any alteration or addition to an existing building or to any existing sewerage work unless and until plans have been submitted to, and approved by, the local authority in terms of these by-laws for all and every part of the work involved in such alterations or additions.

(2) Notwithstanding the provisions of subsection (1), the local authority may issue a permit exempting a person from the need to submit plans of minor alterations or additions which—

(a) are not likely to cost more than two hundred and fifty dollars; and

(b) do not involve any work being carried out on any sewerage system.

(3) A permit issued in terms of subsection (2) shall specify—

(a) the name of the applicant; and

(b) the location of the site upon which the alterations or additions are to be effected; and

(c) the nature of the alterations or additions which are permitted to be effected.

(4) No person shall construct any building or any portion thereof which is to be supported by any existing building or portion thereof, including foundations, unless the existing work is proved to have been constructed—

(a) in accordance with the requirements of these by-laws; or

(b) in such a manner that the local authority is satisfied, after an inspection of the existing work that such work presents no hazard to the health of persons who may use the building, and that such work is sufficiently sound and stable to support the proposed additions or alterations.

PLANS TO BE SUBMITTED: ALTERATIONS, ADDITIONS AND PARTIAL RE-ERECTIONS

8. Subject to the provisions of section 9, where alterations or additions are to be effected, or any part of a building is to be re-erected, the plans to be submitted shall be those mentioned in subsection (1) of section 6:

Provided that—

(i) no sewerage plan need be supplied where—

(a) the existing sewerage system is not to be affected by or built over by the proposed work; and

(b) no new connexions are to be made to the sewerage system;

(ii) no plans other than the site-plan and plans and sections of the sewerage work to be undertaken need be provided where the proposed works affect the sewerage system only.

SUBMISSION OF PART-PLANS

9. (1) Where—

(a) alterations or additions are to be effected or part of a building is to be re-erected; and

(b) the local authority already has a complete set of all plans referred to in section 6 for the building concerned;

the applicant may apply to the local authority for permission to submit part-plans.

(2) An application in terms of subsection (1) shall be submitted in duplicate, and shall set out—

(a) the designation of the site concerned, including the stand-number and street-address; and

(b) a brief account of—

(i) the nature and extent of the proposed work; and

(ii) the materials which it is proposed to use; and

(c) the estimated value of the work.

(3) The applicant shall sign and date all copies of the application.

(4) Upon receipt of an application in terms of this section, the local authority may, either orally or in writing, call for further plans or information in relation to the existing building or the proposed changes.

(5) If the local authority agrees to permit the submission of part-plans, it shall—

(a) approve the application, causing the form to be endorsed accordingly; and

(b) specify on the form—

(i) the extent of the existing building which, in addition to all proposed new work, must be shown on the plans to be submitted for approval in respect of the new work; and

(ii) any further information relating to the safety, stability and durability of such existing work as the local authority may require.

(6) The local authority shall thereupon return one copy of the endorsed application form to the applicant, and shall file the second copy.

(7) The endorsed application form shall be referred to as a part-plan permit, and shall be read as one with the part-plans submitted and approved in respect of the work.

(8) If an applicant, having obtained a part-plan permit, submits part-plans not covered by the permit, the permit may be withdrawn, and the local authority may either call for a fresh application for permission to submit part-plans or require full plans to be submitted.

MATERIAL UPON WHICH PLANS TO BE PREPARED

10. Plans submitted in terms of these by-laws shall be prepared on sheets of standard A0, A1, A2 or A3 size, and shall be clear prints on white paper or other material approved by the local authority:

Provided that, if the local authority is satisfied that adherence to these specifications is, for any reason, not feasible, it may accept plans prepared on paper or other material of such other size or sizes as it may specify.

SCALES TO WHICH PLANS TO BE DRAWN

11. (1) The scale to which any plan is drawn shall be clearly stated on each drawing.

(2) Site-plans and main sewerage plans shall be drawn to one of the following scales—

(a) if the area of the site exceeds one hectare, 1 to 2 000, 1 to 1 000 or 1 to 500;

(b) if the area of the site is one hectare or less; 1 to 500, 1 to 200 or 1 to 100.

(3) Working-drawings shall be drawn to a scale of 1 to 100, 1 to 50 or 1 to 20.

(4) Detailed sewerage plans shall be drawn to a scale of 1 to 100 or 1 to 50.

(5) Detail drawings shall be drawn to a scale of 1 to 50, 1 to 20, 1 to 10, 1 to 5, 1 to 2 or 1 to 1.

(6) In the case of stress diagrams, a scale shall be used from which accurate determination of stresses and forces can be made by measurement.

(7) Local authorities may permit other scales to be used if a reasonable need to use such other scales can be demonstrated.

COLOURS TO BE USED ON PLANS

12. (1) All copies of site-plans of alterations and additions to existing works shall be prepared using the following fixed colours and forms of representation—

(a) areas of proposed work, red;

(b) work to be demolished, uncoloured and outlined with black dotted lines;

(c) new private sewers, brown;

(2) Working-drawings of alterations and additions to existing works shall be prepared using the following fixed colours and forms of representation—

(a) new brick and masonry, red;

(b) new concrete, green;

(c) new iron or steel, blue;

(d) new wood, yellow;

(e) all other new materials, to be clearly indicated and to be described in words;

(f) work to be demolished, uncoloured and outlined with black dotted lines.

(3) Sewerage and drainage plans of alterations and additions to existing works shall be prepared using the following fixed colours and forms of representation—

(a) new sewers and new soil-pipes, brown;

(b) new waste-pipes and new private sewers carrying trade effluent, orange;

(c) new waste-pipes and new waste-sewers, green;

(d) new vent-pipes to all types of pipes, red;

(e) new private drains, blue.

CONTENT OF SITE-PLANS

13. Site-plans shall fully and clearly show the following information—

(a) the registered designation of the site, affected by the proposed work; and

(b) particulars of the location of the site, indicating—
  (i) the name of the street upon which the site abuts; and
  (ii) the widths of the abutting side-walks, if any; and
  (iii) the widths of the abutting road reservation, if any;
  and
(c) the dimensions and boundaries of the site; and
(d) the nature and position of—
  (i) all natural watercourses, ravines, large boulders, cliffs, banks, slopes or other natural features, resulting in changes of ground-level; and
  (ii) all sewers, drains, water-mains, electric or other cables or wires, and any structures or installations supporting or connected with any of the foregoing; and
  (iii) all building-lines, rights of way and servitudes associated with the services specified in subparagraph (ii);
  which exist upon or traverse the site; and
(e) the location upon the site of—
  (i) every building which it is proposed to erect, alter or add to; and
  (ii) any other building existing upon the site; and
  (iii) the positions of the water-connexions and sewer-connexions for the site, and their distances from a specified corner-peg or other reference point; and
  (iv) proposed vehicle-entrances to the site; and
(f) the distances of all buildings on the site from one another, and from the boundaries of the site; and
(g) reduced levels at corners in relation to a datum, if such information is required by the local authority; and
(h) the direction of true north.

CONTENT OF WORKING-DRAWINGS

14. (1) Working-drawings shall consist of as many plans, sections and elevations as may be necessary fully and clearly to show the position, form, dimensions and materials of every part of the building intended to be erected.

(2) Working-drawings shall depict—
(a) the position and horizontal and vertical dimensions of—
  (i) the pilings, if any, and foundations, regard being had, in particular, to the requirements of sections 12 and 16 of Chapter 4; and
  (ii) all floors, walls, windows, doors, stairs, roofs and chimneys;
  and
(b) all sanitary fittings; and
(c) all structural members, including columns, slabs, beams, joists, rafters, trusses, battens and purlins; and
(d) all projections from a building, be they fixed or movable, including windows on the ground floor which project or open outwards; and
(e) the proposed method of ventilation, the position of ventilation inlets and outlets, and such information as may be required in terms of section 7 of Chapter 10; and
(f) the proposed method of natural lighting; and
(g) where the design loading is in excess of two kilopascals, the maximum superimposed load per unit of area for which the floor and every room or compartment or any particular portion of the building is designed; and
(h) the occupancy classification of the building for the purposes of section 4 of Chapter 11; and
(i) the intended use of every room or compartment, including—
  (i) in the case of a public building, the maximum number of persons for whom accommodation is provided in each room or area; and
  (ii) in the case of the conversion of a building for a different use, the original and the proposed use of every room or compartment concerned; and
  (iii) in the case of a building intended to be used as a place of assembly of an indoor nature, details as to the seating and aisles as required by Part IV of Chapter 11;
  and
(j) details of intended permanent earthworks affecting the buildings intended to be erected, or possibly affecting adjacent buildings; and
(k) the levels of the floors, relative to one another, and in relation to—
  (i) the existing ground-surface; and
  (ii) the proposed finished ground-surface; and
  (iii) any public place upon which the site abuts; and
  (iv) the kerb of any adjoining street or subway; and
(l) all provisions made in the design of the building for proposed future additions; and
(m) the position of any permanent fire-extinguishing equipment to be installed; and
(n) any other details or information which the local authority may require to enable it to ascertain whether the building intended to be erected will comply with the requirements of these by-laws and be safe, sound and healthy.

CONTENT OF SEWERAGE AND DRAINAGE PLANS

15. (1) Sewerage plans shall consist of as many plans, sections and elevations as may be necessary clearly to show full particulars of all intended and existing sewers and sanitary fittings.

(2) The local authority may further require a sewerage plan to depict as many plans, sections and

elevations as may be necessary to show full particulars of—

(a) all existing and proposed drains; and

(b) the proposed arrangements for the discharge of rain-water from the building and its site.

(3) Sewerage plans shall depict—

(a) each floor or level in plan and in elevation along the line of the plumbing and sewerage systems;

(b) the size, depth and position of every private sewer;

(c) the size and position of every manhole, means of inspection, rodding-way, gully, trap, soil-water pipe, waste-water pipe and vent-pipe;

(d) the position of every trap, soil-water fitting and waste-water fitting;

(e) the gradient, in figures, of every private sewer or drain and any change in the gradient of any such sewer or drain;

(f) the material of which all such sewers, pipes and vents are constructed or are to be constructed;

(g) the levels of the ground and the levels of the inverts of all private sewers at the highest points of such private sewers, at all manholes and at all points at which the gradient of such sewers is changed, all such levels giving the height of the points concerned above such datum-level as the local authority may specify;

(h) the positions and heights of all chimneys, windows and other openings within a horizontal distance of six metres from the open end of any soil-pipe, waste-pipe or vent-pipe;

(i) the positions of connexions and invert-levels at any points specified by the local authority, all levels being shown on the drawings in relation to such datum-level as the local authority may specify.

(4) The following abbreviations may be used on sewerage and drainage plans—

A.C.	access-cover
A.E.	access-eye
B.	bath
C.I.P.	cast-iron pipe
C.T.	conserving tank
D.C.	disconnecting-chamber
D.T.	disconnecting-trap
D.U.T.	dished universal trap
F.A.I.	fresh-air inlet
F.C.	flushing-cistern
F.V.	flushing-valve
G.	gully
G.E.P.	glazed earthenware pipe
G.T.	grease-trap
I.C.	inspection-chamber
I.E.	inspection-eye
I.T.	interceptor-trap
M.	water-meter
M.H.	manhole
O.V.P.	outlet vent-pipe
R.W.	rodding-way
R.W.P.	rain-water pipe
S.	sink
S.A.P.	soil anti-siphon pipe
S.C.	stopcock
S.G.	stable-gully
S.H.	slop-hopper
S.P.	soil-pipe
S.T.	septic tank
S.V.P.	soil vent-pipe
S.W.P.	stoneware pipe
U.	urinal
U.T.	universal siphon-trap
V.P.	vent-pipe
W.	waste-pipe
W.A.P.	waste anti-siphon pipe
W.B.	wash-basin
W.C.	water-closet
W.P.	water-pipe
W.T.	water-tap
W.T.(H.)	water-tap (hot)
W.V.P.	waste vent-pipe

ACCURACY OF PLANS

16. It shall be the respons bility of any person preparing or submitting plans for approval by the local authority to ensure the accuracy of those plans, and no person shall include on any plan any information which—

(a) he knows to be false; or

(b) is false, and which he has no reasonable cause to believe to be correct.

RECEIPT AND CONSIDERATION OF PLANS

17. (1) The official dated receipt of payment of building or sewerage plan fees shall be acknowledgement of receipt of the plans.

(2) Within thirty-five days of the date on the receipt referred to in subsection (1), the local authority shall either—

(a) subject to their complying with the conditions of title of the premises concerned, any town planning scheme or any public health requirement, the provisions of these by-laws, and any other law, approve the plans; or

(b) reject the plans, in which case the reasons for such rejection shall be clearly explained to the applicant, either orally or in writing; or

c) notify the applicant of a later date by which the local authority will advise the applicant of the outcome of the consideration of the plans; or

(d) notify he applicant of—

(i) any amendment or amplification required of the plans to obtain compliance with these by-laws; and

(ii) the period within which such amendment or amplification should be completed and submitted to the local authority.

3) The local authority may, in its sole discretion, extend the period specified in terms of paragraph (d

of subsection (2), and, if the applicant fails to submit the completed amendment or amplification within the specified period, the local authority may give notice to the applicant that his plans have been rejected.

(4) The local authority may approve plans prior to finally approving the particulars of structural detail drawings:

Provided that no work shall be commenced upon the erection of any structural members, framework or reinforced concrete until structural detail drawings have been submitted to, and approved by, the local authority.

(5) Within thirty-five days of receiving structural detail drawings the local authority shall advise the applicant of its decision thereon, in accordance with the provisions of subsection (2), and, if amendment or amplification is required, the provisions of subsection (3) shall, *mutatis mutandis*, apply.

CUSTODY OF APPROVED PLANS

18. When an application, a plan or a drawing is approved—

(a) one copy shall be retained by the local au.hority; and

(b) one copy shall be retained by the applicant and kept at the site of the work, in accordance with the provisions of section 29.

BUILDING AND SEWERAGE WORK TO BE CARRIED OUT IN ACCORDANCE WITH APPROVED PLANS

19. (1) No person shall undertake any building or sewerage work in respect of which plans. have been approved by the local authority otherwise than in accordance with—

(a) the approved plans; and

(b) any directions, orders, measures, precautions or other requirements lawfully made, given, approved or undertaken in terms of these by-laws; and

(c) the provisions of these by-laws.

(2) No person shall carry out any work in respect of which an undertaking of supervision has been given in a certificate referred to in paragraph (e) of subsection (1) of section 6 without the carrying out of such work being supervised in accordance with such undertaking.

ALTERATIONS TO, AND DEPARTURES FROM, APPROVED PLANS

20. (1) If a person wishes to alter or depart from plans approved by the local authority, he shall submit to the local authority a request for leave to alter or depart therefrom and receive approval prior to the commencement of the work.

(2) An application in terms of subsection (1) shall—

(a) be accompanied by the prescribed fee; and

(b) be submitted in duplicate on the form provided by the local authority for such applications; and

(c) give a clear reference to the original plan; and

(d) set out the nature of the alteration or departure proposed.

(3) The local authority may—

(a) approve the application and direct that appropriate changes and endorsements be made upon the two copies of the approved plans; or

(b) require revised plans to be submitted, covering the proposed alterations or departures, and, once such plans have been prepared, to the satisfaction of the local authority, approve the application; or

(c) reject the application and require the plans to be re-prepared in accordance with these by-laws.

(4) Notwithstanding the provisions of subsection (3), and subject to the provisions of subsection (5), the local authority shall not insist upon a revised plan or a new plan in respect of alterations—

(a) limited to the replacement of a door or a window; or

(b) limited to a replacement of the finish of a floor, a ceiling or a wall with a finish of another type:

Provided that the strength and durability of the floor, ceiling or wall concerned will not be impaired by the omission or removal of the finish originally approved or by the application of the new finish.

(5) If any person effects any alteration of the type mentioned in subsection (4)—

(a) the local authority may thereafter satisfy itself that the work undertaken is sound and adequate for the purposes which it will have to serve before any further work may be undertaken; and

(b) appropriate alterations to the approved plans shall be made and signed by or on behalf of the applicant, or a suitable revised plan shall be submitted, to the satisfaction of the local authority.

PRIOR APPROVAL OF PLANS UNNECESSARY FOR URGENT SEWERAGE WORK

21. (1) If the delay which would attend the preparation, examination and approval of plans for he installation, modification or alteration of any sewerage work would result in conditions which could in any way be prejudicial to public health, the local authority may authorize the installation, modification or alteration of such work as a matter of urgency, and dispense with the need to await the approval of appropriate plans.

(2) If the local authority does authorize the undertaking of any urgent sewerage work in terms of subsection (1)—

(a) the local authority may give such directions concerning excavations, inspections, the

manner in which the work shall be conducted and the nature and testing of the sewers which are installed as it deems fit; and

(b) the owner of the site upon which the work is carried out shall, within such period as the local authority may specify, submit plans, complying with the requirements of this Part, of the sewerage works which were installed, modified or altered.

LAPSING OF APPROVAL, AND INCOMPLETED BUILDINGS

22. (1) Approval given by the local authority in terms of this Part shall become null and void after the expiration of twelve months from the date of such approval unless the construction of the building or installation of the sewerage works concerned is commenced within that period.

(2) Whenever the construction of a building or an installat on of sewerage works has been discontinued for a period in excess of six months, the local authority may, by written notice, require the owner to complete the work within such reasonable period as may be specified in such notice.

(3) If the owner fails to comply with the notice served in terms of subsection (2), the local authority may revoke the approval given under this Part, and may, by written notice, require the owner concerned—

(a) to restore the site to its original condition within such further period as may be specified in the notice; or

(b) to take such other action as the local authority may specify in order that the work and site may be rendered safe, tidy and as little offensive as possible.

PART II

PRELIMINARIES TO UNDERTAKING OF BUILDING AND SEWERAGE WORKS, AND GENERAL CONDUCT THEREOF

NOTICE OF INTENTION TO COMMENCE WORK, AND NOMINATION OF SITE REPRESENTATIVE

23. (1) Not less than two days before commencing to clean the site or to undertake any work thereon, the builder or plumber shall give notice to the local authority, on the form provided by the local authority for such purpose, of the date upon which he intends to commence work upon the site.

(2) The notice referred to in subsection (1) shall nominate a person who shall represent—

(a) the owner; and

(b) the builder or plumber;

to whom the local authority may give any instructions, directions or notices addressed to such owner, builder or plumber in respect of the building or sewerage work to be undertaken on the site.

(3) The same person need not be appointed to represent both the owner and the builder or plumber.

SITE BOUNDARIES

24. If the local authority is not satisfied as to the exact position of the boundaries of a site on which a building is to be erected or is in the course of being erected, it may, by written notice served upon the owner of the site concerned—

(a) direct the owner to engage, at his own expense, a registered land surveyor to establish the precise position of the boundaries of the site; and

(b) prohibit all further building work until the position of the boundaries has been precisely established;

and the owner shall thereupon comply with the terms of the direction and any prohibition.

CLEANING OF SITE

25. (1) No person shall erect a building upon ground upon which there is any vegetable matter or any offensive or unhealthy waste, substance or matter, or any substance liable to disintegrate or decompose, unless and until he has had all such matter and any earth so rendered unstable or unhealthy removed from the site, or treated so as to render it stable and healthy.

(2) No person erecting a building shall commence to excavate for the foundations of such building until all the ground to be covered by such building and falling within one metre of the exterior of such building has been cleared of all vegetation, debris and refuse:

Provided that the owner of the site may apply to the local authority for permission to leave standing any tree, bush, plant or lawn which he may specify, and the local authority may grant such permission, in its sole discretion.

EXCAVATIONS, PROTECTION OF PUBLIC WORKS AND ADJACENT BUILDINGS, AND CONFORMITY WITH STREET-LEVELS

26. (1) The local authority may require any person embarking upon any building or sewerage work—

(a) to indicate the methods and programme which he intends to follow in the undertaking of any preparatory excavations; and

(b) to submit plans and drawings illustrating the manner in which such work will be undertaken.

(2) The person undertaking the work shall ensure that the proposed excavation is undertaken in such a manner as will result in—

(a) compliance with the provisions of section 10 of the Factories and Works (Building, Structural and Excavation Work) Regulations, 1976, published in Rhodesia Government Notice No. 264 of 1976, or any other regulations prescribing safety measures for persons engaged on excavation, building or sewerage work; and

(b) a minimum of damage to, or interference with, drains, pylons, poles, sewers, cables,

water-mains, or similar works installed or maintained by the State, the local authority, the Electricity Supply Commission, the Posts and Telecommunications Corporation or any similar body; and

(c) a minimum of interference with the safety, stability and unhindered use of any pavement, street, public place or building on a site adjoining the site upon which the work is undertaken;

and, to this end, the local authority may require the person undertaking the work to adhere to methods, programmes, plans and drawings approved by the local authority.

(3) If the local authority has not yet levelled, cambered, paved, flagged, gravelled, metalled, kerbed, drained or otherwise made up any pavement, street or public place adjoining the site upon which building or sewerage work is to be undertaken, the owner of the site upon which the work is to be undertaken shall request the local authority to advise him of—

(a) the levels at which it is proposed to make up the pavement, street or public place; and

(b) any measures which must be taken concerning the location and construction of any building, sewerage or drainage work, driveway, entrance or other improvement upon the site so as to avoid adversely affecting, or being adversely affected by, any pavement, street or public place subsequently made up upon any adjoining land.

(4) Notwithstanding the provisions of subsection (2), if the nature of the soil exposed by excavation, the weather, the behaviour of adjacent buildings or pavements or other unforeseen circumstances necessitates urgent steps being taken which are not in conformity with the methods, programmes, plans and drawings approved by the local authority, the person undertaking the excavation work may take such steps as he deems fit to safeguard persons working on the site, drains, sewers, cables, water-mains and similar works traversing the site, and any land, building, street or pavement adjoining the site:

Provided that, in such circumstances, the provisions of subsection (5) of section 20 shall, *mutatis mutandis*, apply.

INTERFERENCE WITH PAVEMENTS, STREETS AND PUBLIC PLACES

27. (1) No person shall—

(a) erect any hoarding, scaffolding, fence, gangway or other such temporary barrier or structure, whether or not it is required n terms of Chapter 12, upon or within one metre of any pavement, street or public place; or

(b) undertake any building or sewerage work which is otherwise likely to interfere with, obstruct or render dangerous any pavement, street or public place;

unless and until he has obtained the written permission of the local authority and paid the prescribed fee.

(2) Application for the permission required in terms of subsection (1) shall be submitted in the form prov ded by the local authority for such applications, and such form shall be completed in all material respects

(3) Upon receipt of an application in terms of subsection (2), the local authority—

(a) may require the submission of such plans or information as it deems necessary;

(b) shall, once it is satisfied that it has sufficient information, by written notice served upon the owner of the site concerned and the person undertaking the work, grant permission to erect such structures upon and to make such use of, any pavement, street or public place as may be reasonably necessary for the purpose of undertaking the work.

(4) In granting permission in terms of subsection (3), the local authority may give directions as to—

(a) the parts of the pavement, street or public place which may be interfered with or obstructed; and

(b) the times at which, and period for which, interference or obstruction may be permitted; and

(c) the nature of any structure which may be erected; and

(d) the form which any interference or obstruction may take; and

(e) the time by which, and stages at which, any obstruction shall be removed and any damage shall be repaired; and

(f) any other matter which is intended to reduce inconvenience to the public and to ensure the safety of the public and persons working on the site;

and the persons to whom the directions are directed shall give effect to those directions.

(5) If the local authority considers that any building or sewerage work interferes with, or is likely to interfere with, obstruct, damage or render dange ous any pavement street or public place, it may, by written notice served upon—

(a) the owner of the s te concerned; and

(b) the person undertaking the work;

direct those persons to take one or more of the steps specified in subsection (6).

(6) Upon service of the written notice referred to in subsection (5), the persons upon whom it has been served shall take one or more of the following steps—

(a) cease to interfere with or obstruct such pavement, street or public place;

(b) take such action as the local authority may specify in order to reduce the interference, obstruction, damage or danger;

(c) repair any damage which has already been caused;

and, in such notice, the local authority may give directions as to any matter mentioned in subsection (4).

(7) Notwithstanding the provisions of this section, where—

(a) the need arises to effect urgent repairs or maintenance; or

(b) the state of a building which is being or has been erected renders the use of any adjoining pavement, street or public place, dangerous;

a person may forthwith erect such scaffolding, fence or other barrier, and cause such interference or obstruction as may be necessary in the circumstances:

Provided that—

(i) the person taking such action shall notify the local authority as soon as possible of—

(a) the action which he has taken; and

(b) the reason for taking that action; and

(ii) the local authority may thereafter—

(a) give such directions as it deems fit in order to minimize any inconvenience caused to the public, and to ensure the safety of the public and persons working on the site; and

(b) require payment of the prescribed fee.

BUILDERS' SHEDS AND TOILETS

28. (1) Notwithstanding anything to the contrary contained in these by-laws, any person undertaking or preparing to undertake any building or sewerage work which has been approved by the local authority may erect such builders' sheds, toilets and other temporary structures as may be reasonably required—

(a) for the convenience of persons working on the site; or

(b) for the storage of materials and tools.

(2) No person shall construct or maintain any such temporary structure in such a location or in such a manner that it is or may become a nuisance or a danger to the health or safety of persons working on the site or of the public, and such structures shall be used solely in connexion with the execution of the approved work.

(3) Any person undertaking building or sewerage work shall, before commencing work, ensure that, for every twenty-five persons working on the site, there is at least one toilet available to such persons on the site or within fifty metres thereof, and, if necessary, shall provide temporary toilet accommodation on the site.

(4) Any toilet provided in terms of subsection (3) shall be so situated, constructed, screened and maintained as not to be offensive or to cause a nuisance or danger to the health of the public or persons working on the site.

(5) The person undertaking the work shall ensure that any temporary toilet provided on the site is cleaned and, in the case of bucket latrines and chemical closets, is cleared at least once in every twenty-four hours.

PLANS TO BE KEPT ON SITE

29. The person erecting any building or undertaking any sewerage work shall ensure that signed copies of all applications, plans and drawings referred to in Part I and approved by the local authority for the purposes of any particular work are at all times—

(a) kept upon the site of such building or sewerage work; and

(b) maintained in a legible condition.

INSPECTION OF EXCAVATIONS AND FOUNDATIONS

30. (1) No person shall commence the work of constructing the foundations of any building or the installing of any sewerage work until—

(a) notice has been given in the form provided by the local authority for this purpose; and

(b) the prescribed fee for inspection, if applicable, has been paid; and

(c) the excavations for such work have been inspected; and

(d) permission to proceed with the work has been given by the local authority.

(2) No person shall backfill any excavations made for foundations, or construct anything upon the foundations of a building, until—

(a) notice has been given in the form provided by the local authority for this purpose; and

(b) the prescribed fee for inspection, if applicable, has been paid; and

(c) the foundations have been inspected; and

(d) permission to continue with construction has been given by the local authority.

(3) Notwithstanding the provisions of subsection (2), the local authority may permit a person to backfill excavations and continue with the construction of the building without awaiting inspection by the local authority if the design and construction of the foundations are under the supervision of a person approved by the local authority as being qualified to determine the adequacy of the foundations, in which case—

(a) the person so approved shall provide the local authority with a certificate of approval in respect of the foundations of each building the construction of which he has authorized to be continued; and

(b) the owner shall pay the prescribed fee, if applicable, for such inspection.

(4) No person shall commence to backfill any excavations made for sewerage work until the sewerage work has been inspected and has satisfied all tests carried out by the local authority in terms of Part VII of Chapter 9.

(5) The notices referred to in this section shall be delivered to the local authority at least two clear working days before the date specified in the notice for inspection of the excavations, foundations or sewerage work.

GENERAL CONDUCT OF BUILDING OPERATIONS

31. (1) Every person undertaking building or sewerage work shall take all reasonable steps to

avoid and mitigate any nuisance which may be caused by such work, and, in particular, shall ensure that—

(a) gutters and drains for the flow of surface-water are kept clear at all times; and

(b) subject to permission being obtained from the local authority, access to fire-hydrants, lamp-posts, parking-meters, transformers, public telephones, post-boxes and other public facilities is not obstructed by piles of material, scaffolding, hoardings, barriers or otherwise; and

(c) effective steps are taken, including the covering, sprinkling and wetting-down of materials, during demolition work, to prevent dust, smoke, harmful fumes or other harmful agents spreading over adjacent premises or public places during building, demolition or sand-blasting operations, or during the conveyance of materials and rubble to and from the site; and

(d) noisy and disruptive operations are not undertaken on Sundays and public holidays or after 6 p.m. or before 7 a.m. on other days without written permission of the local authority.

(2) In addition to observing the provisions of this Chapter, every person undertaking building or sewerage work shall comply with the provisions of Parts III and IV of Chapter 12.

REMOVAL OF SHEDS AND RUBBLE, AND REPAIR OF PUBLIC PLACES

32. (1) Upon completing any building or sewerage work, the builder or plumber shall—

(a) repair any damage, or defray costs of such work if it is undertaken by the local authority, which has been caused to any pavement, street or public place in the course of constructing the building or installing the sewerage work; and

(b) remove from the site and any adjoining site or pavement, street or public place—

(i) any hoarding, scaffolding, fence, gangway or other barrier erected in terms of section 27; and

(ii) any temporary structure erected in terms of section 28; and

(iii) all refuse, debris, surplus building materials and rubble.

(2) At any time before the completion of any building or sewerage work, the local authority may direct the person undertaking the work, by written notice served upon him, to take any action mentioned in subsection (1) if—

(a) the hoardings, structures, toilets, materials or rubble are—

(i) causing a nuisance or danger to the public; or

(ii) no longer needed on the site, and are in any way offensive or unsightly; or

(b) it is possible to repair the pavement, street or public place, and to make it safely available for use by the public without undue interference with the continued progress of the building or sewerage work.

(3) When the builder or plumber has complied with the provisions of subsection (1) and any directions given in terms of subsection (2), the local authority shall, after deducting the cost of any work undertaken by the local authority—

(a) on behalf of, and at the request of, the owner; or

(b) in consequence of any failure to comply with directions of the local authority given in terms of subsection (2);

refund the fee paid in terms of subsection (1) of section 27.

PART III

PROJECTIONS AND ENCROACHMENTS

PERMISSION TO BE OBTAINED FOR PROJECTIONS AND ENCROACHMENTS

33. (1) Subject to the provisions of section 35, no person may, without the written permission of the local authority, construct a building or part of a building or any fixed or movable projection from a building so as to encroach upon, over or under any pavement, street or public place.

(2) If any person wishes to construct a building, part of which will project over or under or encroach upon a pavement, street or public place, he shall, either before or upon submitting plans of the proposed work for approval in terms of Part I, apply to the local authority for permission to construct such projection or encroachment.

(3) The application referred to in subsection (2) shall be submitted on the form supplied by the local authority, and the form shall be completed in all relevant respects.

GRANTING OF PERMISSION

34. Every person whom the local authority has in terms of section 33 or by resolution in terms of section 166 of the Act permitted to erect or construct a projection or encroachment shall, in addition to complying with any other conditions which the local authority may impose—

(a) assume full responsibility for the safety and proper maintenance of the projection or encroachment, and for any costs or liabilities incurred from any accident which in any way stems from the construction, presence or condition of such projection or encroachment; and

(b) pay to the local authority the appropriate recognition fee fixed by the local authority in terms of section 172 of the Act; and

(c) permit attachments to be made to the projection or encroachment free of charge for the purpose of fixing street-lights, telephone and electrical cables or otherwise facilitating the provision of public services in and near the building; and

(d) when required by the local authority to do so, construct or restore paving, channelling or

kerbing on any land above, under or near the projection or encroachment.

PERMIT-FREE ENCROACHMENTS

35. (1) No permit shall be required in terms of section 33 in respect of—

(a) a cornice, a moulding, a lintel or a similar feature; or

(b) drop-awnings or sunblinds; or

(c) external hose-connexions for fire-fighting systems;

which comply with the relevant provisions of Chapter 8, Part V of Chapter 11 or Part II of Chapter 12.

(2) Notwithstanding the provisions of subsection (1)—

(a) all projections or encroachments referred to therein shall be deemed to be constructed subject to the revocable consent of the local authority; and

(b) the local authority may charge the prescribed fee for such projections or encroachments.

CONSTRUCTION OF PROJECTIONS AND ENCROACHMENTS

36. The construction of a projection or encroachment may be undertaken only after plans thereof have been submitted and approved in terms of Part I, and shall in all other respects be undertaken in accordance with these by-laws.

REMOVAL OF PROJECTIONS AND ENCROACHMENTS

37. Any permission or consent given or deemed to have been given in terms of this Part shall be revocable at the sole discretion of the local authority, and, subject to the terms of any agreement concluded in terms of section 34, the local authority may require the owner of any building from which a projection or encroachment has been constructed to remove the projection or encroachment at his own expense and within such period as the local authority may specify:

Provided that the local authority may not require a projection or encroachment to be removed within less than six months unless the projection or encroachment has become a danger to persons or vehicles.

DECORATIONS FOR PUBLIC CELEBRATIONS

38. (1) The local authority may, by written notice to any person, waive the provisions of this Part for a specified period, not exceeding six weeks, to permit the erection and display of decorations for a public celebration.

(2) Notwithstanding any waiver in terms of subsection (1), the local authority may order the removal of any decorations which are, or are likely to become, a danger to the health or the safety of the public.

(3) The owner or tenant of any building upon which decorations are erected in terms of this section shall remove such decorations within three weeks of the termination of the public celebrations, or on such date as the local authority may specify in the notice given in terms of subsection (1).

PART IV

EXEMPTED BUILDINGS

CERTIFICATES FOR MINOR STRUCTURES

39. (1) If a proposed building falls within the classes of buildings, referred to in subsection (2), the local authority may issue a certificate authorizing the construction of the building without insisting upon the submission and approval of plans complying with the requirements of Part I.

(2) The provisions of subsection (1) shall apply to any building which—

(a) is designed and intended to be used solely as a pump-house, poultry-run, immovable kennel, summer-house, tool-shed, potting-shed, child's doll's house, aviary, plant-house, coal-shed, wood-shed, cycle-shed, cooking-shelter or swimming-bath changing-room; and

(b) covers an external area not exceeding ten square metres; and

(c) does not exceed—

(i) two metres at the eaves; and

(ii) three metres at the highest part of the roof;

and

(d) is wholly detached and not less than three metres from any other building.

(3) Any person wishing to obtain a certificate in terms of subsection (1) shall make written application, in duplicate, to the local authority on the form provided by the local authority for such applications, and the form shall be completed in all relevant respects.

(4) The form referred to in subsection (3) shall make provision, *inter alia*, for the following information—

(a) the registered description of the site upon which it is proposed to construct the structure; and

(b) a site-plan showing the location of the structure; and

(c) a sketch-plan showing the proposed construction of the structure; and

(d) a statement indicating the purpose for which the structure will be used; and

(e) a statement indicating the nature of the materials with which the structure will be constructed.

GARDEN STRUCTURES AND FENCES

40. (1) A person may construct a fence, wall, pergola, garden shelter, car-shelter or boat-shelter or trellis-screen wall without obtaining—

(a) the approval of plans and drawings complying with the requirements of Part I; or

(b) a certificate issued in terms of section 39;

if the structure is built so as to comply with the provisions of this section.

(2) The provisions of subsection (1) shall apply to a structure, other than a boundary-fence or

boundary-wall, which is built in accordance with the following requirements—

(a) the height of the structure, measured from mean ground-level to the top of the structure, shall not exceed two comma five metres; and

(b) supporting posts or columns shall conform to the requirements of the following Table, and shall be built true and plumb, with their tops terminating in an even plane; and

(c) beams, braces, stays and all structural members shall be of adequate strength, and no member shall have a deflection of more than twenty-five millimetres when loaded; and

(d) no beam shall have a span in excess of three metres; and

(e) all material used shall be sound and durable, and shall be erected in a neat, tidy and workmanlike manner; and

(f) the sides shall not be enclosed, except with open lattice-work.

TABLE
SUPPORTING POSTS OR COLUMNS

Material	Requirement
Bricks, blocks or stone	200 millimetres by 200 millimetres minimum cross-section on 450-millimetre-by-450-millimetre footings of concrete at least 100 millimetres in thickness.
Timber	5 600 square millimetres minimum cross-section with a minimum face of 50 millimetres, or 75 millimetres minimum butt in the case of round poles. Timber posts shall not be carried down into the ground, but shall be securely bolted to concrete foundation-blocks or on to metal stubs in the ground.
Concrete	Minimum 150 millimetres by 150 millimetres or 150-millimetre diameter if unreinforced or 75 millimetres by 75 millimetres or 75-millimetre diameter if reinforced with at least 0,5 *per centum* of reinforcing steel. Posts to be at least 450 millimetres into the ground.
Steel or other metal	Minimum 40-millimetre diameter, whether tubular or solid, and, in the case of tubular posts, the metal shall be at least two millimetres in thickness. Rolled-steel sections shall have a minimum side of 40 millimetres.

(3) No person shall use a structure constructed in terms of this section to accommodate pets, poultry or other livestock, or for the storage of any materials other than plants, garden-tools or machinery.

(4) The provisions of subsection (1) shall apply to a boundary-fence or boundary-wall which is built in accordance with the following requirements—

(a) the boundary-fence or boundary-wall shall not exceed two metres in height; and

(b) boundary-walls in masonry or concrete shall comply with the provisions of Chapter 5; and

(c) boundary-fencing shall comply with the following requirements—

(i) corner-posts and gate-posts shall conform to the requirements for posts laid down in the Table in subsection (2), and shall, in addition, be properly stayed in such manner that they will remain plumb when the boundary-fence is strained; and

(ii) straining-posts shall be provided at intervals of not more than one hundred metres; and

(iii) barbed wire, canvas, sheet iron, corrugated iron or other sheeting shall not be used in the construction of the boundary-fence; and

(iv) all posts shall be plumb and in true lines, and the fencing-wire shall be drawn tight between them.

BUILDERS' SHEDS AND TOILETS

41. Neither the approval of plans complying with the requirements of Part I nor the issue of a certificate in terms of section 39 shall be necessary for the erection of a builder's shed or toilet if such shed or toilet—

(a) is erected and maintained in accordance with the provisions of section 28; and

(b) does not exceed the dimensions described in subsection (2) of section 39.

REMOVAL OF EXEMPTED STRUCTURES

42. (1) The local authority may direct the owner or tenant of any site upon which there has been erected a structure falling within the terms of this Part to remove such structure from the site if at any time the structure becomes—

(a) a danger to the health or safety of persons using the site upon which it is constructed or any neighbouring site or public place; or

(b) unsightly or likely to depreciate the value of any neighbouring premises, or in any way offensive.

(2) Notwithstanding the provisions of subsection (1), the local authority may not direct the removal of any structure in terms of this section without serving written notice upon the owner or tenant concerned—

(a) specifying the reason for the proposed direction; and

(b) giving the owner or tenant thirty days within which to repair the structure or otherwise rectify the objection to the retention thereof specified in the notice;

unless the giving of such notice is likely to endanger the health or safety of the public.

(3) No compensation shall be payable by the local authority as a result of the removal of any structure in terms of this section.

PART V

CONTROL OF GENERAL APPEARANCE, OCCUPATION AND USE OF BUILDINGS

APPEARANCE OF PROPOSED BUILDINGS

43. (1) In considering plans submitted for approval in terms of Part I, the local authority shall have regard to—

(a) the location on the site of the proposed buildings; and

(b) the design and exterior decoration of a proposed building; and

(c) the general appearance which the building is likely to assume; and

(d) the suitability of such a building in the setting for which it is designed; and

(e) urban aesthetics generally.

(2) Notwithstanding the fact that a proposed building will comply with these by-laws in all other respects, the local authority may—

(a) reject the plans of the building; or

(b) require the plans to be modified;

if, in the opinion of the local authority, the proposed building is not likely to be in general harmony with the class and character of buildings in the neighbourhood, or is likely, for any reason whatsoever, to be dangerous or unhealthy.

OCCUPATION OF NEW BUILDINGS

44. No person shall occupy a new building until—

(a) the owner has applied for a certificate of occupation and paid the prescribed fee; and

(b) the building has been inspected by the local authority and the local authority has issued the certificate approving the building as being ready and suitable for occupation:

Provided that—

(i) subject to considerations of health and safety, the local authority may permit a reasonable number of watchmen to occupy or use a building before the building is approved for occupation; and

(ii) the local authority may approve the occupation of part of a building before the whole building is completed, subject to such conditions as the local authority may impose.

USE OF NEW SEWERAGE SYSTEMS

45. No person shall use any new sewerage system until—

(a) the owner has applied for a certificate of approval and paid the prescribed fee; and

(b) the sewerage system has been tested by, or in the presence of, a representative of the local authority in accordance with the provisions of Part VII of Chapter 9; and

(c) the local authority is satisfied that the sewerage system complies with the requirements of these by-laws, and has issued a certificate approving the sewerage system as being duly completed.

OCCUPATION AND USE OF BUILDINGS

46. (1) Save with the written permission of the local authority, no person shall occupy or use a building which has been erected otherwise than in accordance with plans and drawings approved by the local authority.

(2) Save with the written permission of the local authority, no person shall occupy or use a building for a purpose other than that for which such building was erected.

(3) No person shall put a building to use in a manner which is liable to depreciate the value of neighbouring properties or to cause a nuisance.

(4) No person shall permit the occupation or use of a building by persons exceeding the number approved by the local authority.

(5) No person shall subdivide a building in such a manner as—

(a) to be prejudicial to the health or safety of persons using the building or the general public; or

(b) to depreciate the value of neighbouring properties or to cause a nuisance.

LOADING OF BUILDINGS

47. (1) Except for the purpose of a full-scale load test, no person shall, either during construction or after completion thereof, subject a building, or any portion thereof, to a superimposed load greater than—

(a) 200 kilograms over any area of one square metre; or

(b) the load specified in the approved drawings of the building or portion thereof as being the load for which the building or portion is designed;

unless the building has been shown, by test conducted by or on behalf of the local authority, to be capable of bearing a greater load.

(2) Where no approved drawings are available for an existing building, no person shall introduce—

(a) any machinery or other heavy article having a mass of more than five hundred kilograms; or

(b) permit the occurrence or concentration of loads within any part of the building which will result in a floor-loading in excess of 200 kilograms over any area of one square metre;

without first causing the loading which the portion of the building concerned will safely sustain to be estimated by a person who, in the opinion of the local authority, is competent to do so.

(3) Any estimate of the load-bearing capacity of a building given in terms of subsection (2) shall be filed with, and retained by, the local authority, and, thereafter, no person shall cause or permit the loading of that building or any part thereof to exceed the capacity determined in such estimate.

(4) Where the local authority considers that there is a risk of overloading any portion of a building whose floors are designed to withstand an imposed load exceeding 300 kilograms per square metre, the local authority may require the owner or occupier of the building to exhibit, on every floor of such building, in a conspicuous position, a notice, in the form of an

embossed or stamped metal or other durable plate, clearly stating—

(a) the superimposed loading for which the floor is designed; or

(b) if the designs are not available, the safe floor-loading estimated and recorded in terms of subsections (2) and (3).

(5) If a floor or storey designed to withstand an imposed load exceeding 300 kilograms per square metre is subdivided into portions, each designed for a different superimposed loading, the local authority may require notices to be exhibited in each portion of the subdivided floor or storey, in the manner provided for in subsection (4).

(6) In the case of a garage intended to accommodate vehicles not exceeding two thousand two hundred and fifty kilograms gross, the owner of the building shall exhibit, in addition to any notice required in terms of subsection (4), a similarly made and displayed notice, clearly stating the maximum permissible gross mass of vehicles using the garage.

DANGEROUS BUILDINGS

48. (1) Where a building, or any part of a building, has become, or shows signs of becoming, dangerous, the local authority may, by written notice served upon the owner or, if the owner cannot be found, the occupier of the building—

(a) direct him to take such action as may be specified in the notice, or such other action as may be specified by the local authority, in order to terminate or prevent the danger; and

(b) specify the period within which such action shall be taken:

Provided that, if such notice is served upon an occupier, he may notify the local authority that he intends to vacate the building or part concerned within the period specified in terms of paragraph (b), and, if the occupier does so vacate the building or part concerned, he shall not be obliged to comply with the notice.

(2) Where the local authority proposes to serve a notice in terms of subsection (1), it shall, before serving such notice—

(a) cause the prospective recipient thereof to be—

(i) advised, in writing, of such intention, and of the reasons therefor; and

(ii) afforded a reasonable opportunity of lodging written objections thereto or written representations in respect thereof;

and

(b) consider all objections and representations lodged in terms of paragraph (a).

(3) Where the state of a building, or anything in or on a building, is such as to constitute a source of imminent and continuing danger to persons in, or in the vicinity of, the building, the local authority may—

(a) direct any person in the building to leave the building forthwith or within such reasonable period as it may specify; and

(b) prohibit any person from entering the building; and

(c) give directions as to how persons shall enter or vacate the building, and as to which parts of the building may be visited or used; and

(d) at the expense of the owner, erect fences, cordons or barriers to restrict the public from approaching the building; and

(e) take such other measures, including the demolition of the building, after reasonable notice, served upon the owner, as it deems necessary in order to safeguard the public, and charge the owner for any expenses reasonably incurred in so doing.

(4) The local authority may erect a clearly legible notice, in a conspicuous place outside a dangerous building, or in the vicinity thereof, controlling entry into and approach towards the building, and no person shall disregard any such notice.

(5) The letters and figures on any notice erected in terms of subsection (4) shall measure not less than fifty millimetres in height.

(6) Where the local authority has ordered persons to leave a building, prohibited persons from entering a building, or erected a notice in terms of subsection (4), a police officer may, upon being requested so to do by the local authority, forcibly remove or restrain any person who disregards any such order, prohibition or notice

DILAPIDATED AND UNSIGHTLY BUILDINGS AND DEFECTIVE SEWERAGE SYSTEMS

49. (1) No person shall allow any building constructed upon premises of which he is the owner or occupier to become—

(a) a danger to the health of persons occupying or using the building, or to the health of the public; or

(b) the source of unpleasant fumes, smoke or odours; or

(c) unsightly or a disfigurement to the neighbourhood; or

(d) in any other way offensive or embarrassing to the people living or working upon the premises or in the neighbourhood:

Provided that the occupier of any such premises may avoid liability for a contravention of this subsection if he proves that—

(a) he is not responsible for the building becoming objectionable in terms of paragraphs (a) to (d); and

(b) he has notified the owner of the building, and called upon him to rectify the situation.

(2) No person shall decorate, adorn or utilize a building or any part thereof in such a way as to make the building—

(a) a danger to the health of persons occupying or using the building, or to the health of the public; or

(b) the source of unpleasant fumes, smoke or odours; or

(c) unsightly or a disfigurement to the neighbourhood; or

(d) in any other way offensive or embarrassing to people living or working on the premises or in the neighbourhood.

(3) If the local authority has reason to believe that any sewerage system has become—

(a) defective, damaged or blocked; and

(b) a danger to the health of persons occupying the premises, or to public health;

it may order the owner of the building served by such sewerage system to act in compliance with subsection (4).

(4) If the local authority has reason to believe that the conditions mentioned in paragraphs (a) and (b) of subsection (3) exist, it may order the owner of the building concerned—

(a) to satisfy the local authority that the sewerage system has not become defective, damaged or blocked, by carrying out, at the expense of such owner, any one or more of the tests specified in Chapter 9; and

(b) if the sewerage system is shown to be in any way defective, damaged or blocked, to rectify the situation within such reasonable period as the local authority may specify.

PART VI

ENFORCEMENT

TESTING OF MATERIALS BY LOCAL AUTHORITY

50. (1) The local authority shall have the right to test or to have tested any material or thing used or to be used in the construction of any building or sewerage system under construction or to be constructed in order to determine whether such material or thing complies with the provisions of these by-laws.

(2) For the purpose of subsection (1) the local authority may, at any time and as often as it is reasonably necessary for the purpose of so testing the material or thing, and without prior notice to the builder or plumber, remove from the site concerned so much of the material or thing as is reasonably necessary to serve as a sample.

(3) If any material or thing tested in accordance with subsection (1) does not comply with the requirements of these by-laws, the local authority may serve a notice upon the owner of the building or sewerage system concerned—

(a) stating in what respects such material or thing does not comply with such requirements; and

(b) prohibiting any person from making any further use of the material or thing for the purpose for which it was to be used or was being used in the construction of the building or sewerage system; and

(c) ordering the removal of any such material or thing which has been incorporated in the building.

(4) If the local authority serves a notice in terms of subsection (3), the builder or plumber shall, within such period as may be specified in the notice, remove such material or thing from the site, unless the local authority permits such material or thing to be used for some other specified purpose.

(5) Where a person desires to obtain approval to use for a particular purpose any material or thing which is not specifically permitted or prescribed in these by-laws, and the local authority is prepared to consider such a request, the person concerned may—

(a) submit a report from a source acceptable to the local authority on the suitability of such material or thing; or

(b) submit such material or thing for testing by the local authority; or

(c) if required by the local authority, cause to have such material or thing tested by a person acceptable to the local authority.

(6) Any costs involved in tests carried out in terms of subsection (5) shall be borne by the person submitting the request, notwithstanding the provisions of section 57.

(7) The local authority shall permit the use of the material or thing referred to in subsection (5) if the report submitted or the results of the tests demonstrate that such material or thing is at least as suitable for the particular purpose as a material or thing permitted or prescribed in these by-laws for that purpose.

TESTS CARRIED OUT BY OTHER PERSONS

51. (1) Where a person other than the local authority is required or permitted to carry out or to cause to be carried out any test of any material or thing, such test shall be carried out by a person recognized by the local authority as being qualified, whether by experience or by training, to carry out the test.

(2) The result of a test carried out in terms of subsection (1) shall be submitted to the local authority in the form of a report signed by the person who carried out the test, and such report shall give accurate details of—

(a) the testing-apparatus; and

(b) the methods or materials used in carrying out the test; and

(c) the conditions under which the test was carried out; and

(d) a detailed description of all results obtained during the entire course of carrying out the test.

(3) The local authority may require evidence of the experience and training of the person carrying out tests in terms of this section to be furnished to the local authority in order that it may be satisfied as to his competence.

(4) Notwithstanding the provisions of subsection (3), if a test is carried out by a laboratory approved by the local authority, it shall not be necessary to furnish evidence of the experience and training of the person carrying out the test.

SAMPLING

52. Sampling shall be conducted in accordance with the appropriate standard or code of practice or, if there is no such standard or code of practice, in accordance with the requirements of the local authority.

ATTENDANCE AT CONSTRUCTION OF PRINCIPAL STRUCTURAL MEMBERS

53. (1) The local authority may, by written notice, direct a builder to advise the local authority, not less than twenty-four hours in advance, of the time when he proposes to commence construction of any structural member or other part of the building specified in the notice, the correct construction of which member or part is essential to the stability and safety of the whole building or any substantial part thereof.

(2) The builder may give the local authority not less than twenty-four hours' notice of his intention to commence the construction of any structural member or other part of the building the correct construction of which is essential to the stability and safety of the whole building or any substantial part thereof.

(3) If the local authority has directed that it be advised of the commencement of any work in terms of subsection (1), the builder shall not commence to construct the member or part of the building specified in the notice earlier than the time which he has advised the local authority as being the time when he proposes to commence such construction.

CUTTING INTO, LAYING OPEN, DEMOLISHING AND INVESTIGATING WORK

54. (1) If the local authority, after a full and proper investigation, has reasonable grounds to believe that—

(a) any building or sewerage work has been undertaken otherwise than in accordance with approved plans; and

(b) the failure to comply with the plans might result in the building or any part thereof being unstable or in any way dangerous, or the sewerage system being in any way unsatisfactory;

and if the work on the building or sewerage system has progressed so far that it is not possible to ascertain whether or not the plans have been properly followed, the local authority may, by written notice, order the builder or plumber to cause the portion of the work concerned to be cut into, laid open or demolished for investigation to such an extent as may be specified in the notice.

(2) The notice referred to in subsection (1) may specify the time within which such work shall be undertaken.

(3) Where any work is to be cut into, laid open, or demolished for investigation in accordance with an order served in terms of subsection (1), no person shall carry out further work on such building or sewerage system if such further work is to be supported by the work which is to be tested.

FULL-SCALE LOAD TESTS

55. (1) Instead of serving a notice in terms of section 54, the local authority may, in the circumstances set out in that section, by written notice—

(a) order the builder to carry out a full-scale load-test of the building work specified in the notice; and

(b) specify the time within which such test shall be carried out.

(2) Where a builder has received a notice in terms of section 54, he may, not later than forty-eight hours before the expiry of the time specified in the notice, apply to the local authority for permission to carry out a full-scale load-test of the work concerned, instead of cutting into, laying open or demolishing the work.

(3) An application in terms of subsection (2) shall suspend the effect of the notice served in terms of section 54 until the application has been determined by the local authority.

(4) If the local authority is satisfied that a full-scale load-test will render it unnecessary to cut into, lay open or demolish the work referred to in the notice served in terms of section 54, it shall—

(a) grant to the builder written permission to carry out such test; and

(b) specify the work in respect of which such test may be carried out; and

(c) specify the period within which such test shall be carried out;

whereupon the notice served in terms of section 54 shall, to that extent, be deemed to have been withdrawn.

(5) If any person to whom permission has been given in terms of subsection (4) fails to carry out the load-test within the period specified by the local authority, the permission to carry out such test shall lapse, and the builder shall comply with the notice served in terms of section 54 within such further period as may be specified by the local authority.

(6) Any load-test carried out in terms of this section shall be carried out in accordance with the requirements for such tests prescribed in the standard relevant to the type of work and specified in Chapter 3.

(7) Where any work on a building is to be tested in terms of this section, no person shall carry out further work on such building if such further work is to be supported by the work which is to be tested.

(8) Where any work fails to pass a load-test, the builder shall forthwith demolish such work.

(9) Notwithstanding the provisions of subsection (8), the local authority may permit the builder to do such other things in relation to such work as it may specify, and the builder shall complete the doing of such other things within any period specified by the local authority.

(10) If the builder fails to avail himself of permission given in terms of subsection (9) within the period specified by the local authority, the permission shall lapse.

INDEX—CHAPTER 3

CHAPTER 3

STRUCTURAL DESIGN AND CONSTRUCTION

ARRANGEMENT OF SECTIONS

Section

COMBINATION OF LOADS AND FORCES

1. (1) Every building or portion of a building shall be designed and constructed to sustain the most adverse combination of dead loads, superimposed loads and forces to which it may reasonably be expected to be subjected, which loads and forces shall be taken to be not less than the minimum set out in C.A.S. 160, Loads and forces.

(2) The design of every building or portion of a building shall make provision for the combination of loads and forces producing the most adverse conditions of induced stress, deflection and structural instability.

RESISTANCE TO OVERTURNING

2. The moment resisting overturning of any building or part of a building, including the moment provided by foundations, anchorages or other fixings shall exceed the overturning moment due to the most adverse combinations of dead and superimposed loads and forces by at least 50 *per centum*.

CONCRETE

3. The design and construction of reinforced, prestressed or precast concrete structural work shall be deemed to satisfy the requirements of these by-laws if the design and construction is in accordance with—

(a) C.A.S. 164 The structural use of reinforced concrete in buildings; or

(b) C.A.S. 165 The structural use of prestressed concrete in buildings; or

(c) C.A.S. 166 The structural use of precast concrete; or

(d) C.A.S. 170 The structural use of concrete.

STEEL

4. The design and construction of structural steel work shall be deemed to satisfy the requirements of these by-laws if the design and construction is in accordance with C.A.S. 157, The use of structural steel in building.

TIMBER

5. The design and construction of structural timber shall be deemed to satisfy the requirements of these by-laws if the design and construction is in accordance with C.A.S. 162, The use of structural timber in building.

LOAD-BEARING STRUCTURES NOT SPECIFICALLY PROVIDED FOR IN THESE BY-LAWS

6. (1) All load-bearing structures not specifically provided for in these by-laws shall be designed by a structural engineer, who shall provide a certificate to the local authority in accordance with the provisions of paragraph (e) of subsection (1) of section 6 of Chapter 2.

(2) No person shall carry out any work in respect of which an undertaking of supervision has been given in a certificate referred to in subsection (1) without the carrying out of such work being supervised in accordance with such an undertaking.

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CHAPTER 4

FOUNDATIONS

ARRANGEMENT OF SECTIONS

Section

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"bearing area of foundation" means the contact area between the underside of the foundation and the subsoil;

"foundation" means that part of the building or structure which is in direct contact with, and transmits loads to, the subsoil;

"maximum allowable bearing pressure" means the maximum allowable net loading intensity on the subsoil in any given case, the following being taken into account: the maximum safe bearing capacity, the amount and kind of settlement expected, and the ability of the structure to accommodate itself to this settlement;

"maximum safe bearing capacity" means the maximum net loading intensity which the subsoil will safely carry without risk of shear failure, irrespective of any consolidation settlement which may result;

"net loading intensity" means the additional intensity of loading on the subsoil on any horizontal plane due to the mass of the new building or structure, including earthworks if any; that is to say, it is the difference between the total intensity of pressure before building operations are commenced and the total intensity of pressure after the structure is complete and fully loaded;

"sleeper-wall" means a foundation wall erected between other foundation walls to provide an intermediate support to the lowest floor, and having no corresponding wall directly above it;

"subsoil" means the ground which receives the load from the foundation.

PART I

BUILDING SITE AND EXCAVATIONS

INVESTIGATION OF BUILDING SITE

2. When required by the local authority to do so and subject to the provisions of subsection (1) of section 22 of this Chapter and section 23 of Chapter 2, every building site shall be investigated from the point of view of soil conditions which will affect the foundations by a person who, to the satisfaction of the local authority, is qualified by training and experience to do so, and, if required by the local authority, a copy of the report of the site investigation shall be submitted to such authority. Except where the local authority permits otherwise, such investigation shall include one or more soil profiles recorded in accordance with the Schedule.

DRAINAGE OF BUILDING SITE

3. (1) If a building is, or is to be, so situated that water of any kind will drain towards it, adequate drainage shall be provided to divert such water away from the building in such a manner that no erosion of the soil supporting the building and no dampness arising from such water which might adversely affect the stability of the building will occur.

(2) No building shall be erected in or adjacent to any natural watercourse unless the floor level of such building is raised above the maximum known flood level of the watercourse, and precautions are taken, to the satisfaction of the local authority, to ensure no obstruction occurs to the flow of flood waters in the watercourse.

PROVISION OF STABLE FOUNDATION

4. Every building, wall or structure shall be supported on a stable foundation designed and constructed to transmit safely to the subsoil the total load to be carried by the foundation without undue differential settlement of the building or structure:

Provided that—

(i) the local authority may permit the omission of such foundations where the building is supported directly on rock; and

(ii) any decision taken by the local authority regarding the classification of a subsoil or to require or to dispense with the making of a site investigation or the recording of one or more soil profiles on the building site shall not involve the local authority in any responsibility for the safety of the proposed building or structure.

MAXIMUM ALLOWABLE BEARING PRESSURE ON, AND MAXIMUM SAFE BEARING CAPACITY OF, SUBSOIL

5. (1) *Empirical values.*—The net loading intensity pplied to the subsoil shall not exceed the maximum llowable bearing pressure of the subsoil, and such naximum allowable bearing pressure shall in no case xceed the maximum safe bearing capacity of the ubsoil.

(2) In the absence of tests or other supporting vidence, and subject to the provisions of section 6, he maximum safe bearing capacity of the subsoil shall e deemed to be as set out in the Table.

(3) Where there is any doubt as to the classifiation of a subsoil, the decision of the local authority hall be accepted in the absence of professional expert dvice.

(4) In arriving at the value of the maximum llowable bearing pressure in any particular case, account shall be taken of the amount and kind of settlement which may safely be permitted in the building or structure.

(5) *Assessed values of maximum allowable bearing pressure on subsoil.*—The value of the maximum safe bearing capacity of the subsoil and the maximum allowable bearing pressure on the subsoil may be assessed by a person who, to the satisfaction of the local authority, is qualified by training and experience to do so.

(6) Such person shall embody such assessments in a report which he shall lodge with the local authority, which may accept and adopt the assessment.

(7) If the local authority is not satisfied with the report, it may call for a second assessment of the value of the maximum safe bearing capacity of the subsoil and the maximum allowable bearing pressure thereon by a second and similarly qualified independent investigator.

(8) The second investigator shall submit his assessment in a report to the local authority, which shall be entitled, if the assessed values in the two reports differ, to decide which shall be adopted.

(9) The maximum allowable bearing pressure on the subsoil shall not exceed the assessed value thereof which has been adopted in terms of subsection (6) or (8).

NARROW FOUNDATIONS ON NON-COHESIVE SOILS

6. Notwithstanding the provisions of subsections (1), (2), (3) and (4) of section 5, the maximum allowable

TABLE

MAXIMUM SAFE BEARING CAPACITY FOR SUBSOILS UNDER HORIZONTAL FOUNDATIONS AT 600 MILLIMETRES DEPTH BELOW THE ADJOINING FINISHED GROUND-LEVEL SUBJECT TO VERTICAL STATIC LOADING

1	2	3	4
	Class	Type and description of rock and soils*	Maximum safe bearing capacity, in kilopascals
I. Rock	1	Fresh rock, massively bedded, intact; igneous, metamorphic or sedimentary; requiring blasting for excavation	5 000
	2	Fresh rock, fractured or jointed, which can be excavated with difficulty by pneumatic picks but which normally requires light blasting	1 000
	3	Decomposed rock: to be assessed as a soil, as below	
II. Non-cohesive soils	4	Compact, well-graded sands, gravels, and gravel-sand mixtures; permanently above all water-tables	400–500
	5	Compact, well-graded sands, gravels, and gravel-sand mixtures; possibly below the water-table at any stage of the life of the structure	200–250
	6	Compact, but poorly graded gravels, sands, and gravel-sand mixtures; permanently above all water-tables	200–400
	7	Loose sands and gravels	By test only
III. Cohesive soils	8	Very stiff clays, sandy clays, silty clays, sandy silts, silty sands	400–500
	9	Stiff clays, sandy clays, sandy silts, silty sands	200–400
	10	Firm clays, sandy clays, sandy silts, silty sands	100–200
	11	Soft clays, sandy clays, sandy silts, silty sands	50–100
	12	Very soft clays, sandy clays, silty clays, clayey silts, clayey sands	0–50
IV. Artificially occurring soils		Made-up ground, compacted fills, waste-dumps and the like	By test only

* See the Schedule for definitions of soils.

bearing pressure for non-cohesive soils where the least lateral dimension of the foundation is less than 1 metre shall be ascertained by the formula—

maximum allowable bearing pressure = P × b kilopascals

where—

P = the maximum allowable bearing pressure for that type of soil prescribed in subsections (1), (2), (3) and (4) of section 5, in kilopascals; and

b = the least lateral dimension of the foundation, in metres.

HEAVING SUBSOILS

7. Where a heaving subsoil is suspected at the building site (as where shattered or micro-shattered desiccated cohesive subsoil is present) or where previous experience in the area concerned indicates the presence of such a condition, the local authority—

(a) may require a report to be submitted with the building plans, specifying and justifying the measures proposed to be taken to make provision for the differential movements in the building which are likely to arise; and

(b) shall have the power to enforce these proposed measures in full or in part.

COLLAPSING SUBSOILS

8. Where a collapsing subsoil is suspected at the building site (as where loose fine sands or soft damp silty sands, of altered Aeolian origin or from the decomposition of certain granites, are present in the subsoil), the local authority—

(a) may require a report to be submitted with the building plans, specifying and justifying the measures proposed to be taken to make provision for the possible differential settlements which may occur in the building; and

(b) shall have the power to enforce these proposed measures in full or in part.

MADE-UP GROUND

9. (1) No foundations shall bear on fill or other made-up ground except where the local authority has—

(a) been provided with a thorough report on the state of the ground; and

(b) approved precautions proposed to ensure the stability of the proposed building.

(2) Any precautions approved in terms of subsection (1) may be enforced by the local authority.

ANTS' NESTS AND TERMITES

10. (1) Where the nests of ants or termites are encountered, or the roots of trees have to be removed, during excavations for the foundations, the resulting holes shall be refilled and consolidated to the satisfaction of the local authority.

(2) Where the local authority considers that there is a danger to timber from insect pests, or that the area in which a site is located is infested with termites, it may require that—

(a) the soil under the building and foundations be poisoned against termites; and

(b) the floors and frame-members of timber-frame buildings be impregnated with a preservative in accordance with the appropriate recommendations of SABS 05, Preservative treatment of timber (metric).

UNDESIRABLE EXCAVATIONS AND CAVITIES

11. Where an excavation, ditch, pond, watercourse, made-up ground, or similar condition adjoins or is on or adjacent to the subsoil on which any building is to be erected, and, in the opinion of the local authority, is likely to impair the stability of the building—

(a) the foundation of such building shall be constructed at such a depth that the effect of such condition is entirely obviated; or

(b) the excavation or cavity shall be adequately backfilled and consolidated with approved material; or

(c) such other works shall be undertaken as are adequate for the purpose of securing the stability of the building to be erected.

UNDERPINNING AND SUPPORT OF ADJACENT BUILDINGS AND STRUCTURES

12. Where an excavation is liable to cause consequential damage to adjoining buildings, structures, or property, regard shall be had to the provisions of Part II of Chapter 2.

TRENCHES CLOSE TO BUILDINGS

13. No excavation or trench for building purposes shall be made closer to a building than a distance equal to one and one-half times the depth of the excavation or trench, or 1,25 metres, whichever is greater, unless the local authority is satisfied that the stability of such building will not be impaired thereby.

EXCAVATIONS: DEPTH BELOW GROUND-LEVEL

14. (1) Excavations for foundations shall be taken down to firm natural ground, except as otherwise provided in section 9.

(2) Unless a foundation is placed on solid rock, the bottom of the foundation shall be not less than 450 millimetres below the adjoining finished ground-level unless otherwise authorized by the local authority.

(3) If a foundation is placed on solid rock, the bearing area shall be cleaned and, if necessary, stepped or dowelled adequately to prevent lateral movement.

FOUNDATIONS TO BE HORIZONTAL OR HORIZONTALLY STEPPED

15. (1) Except as otherwise provided in section 14 or as shown in the plans approved by the local authority, the surfaces of contact between a foundation and any wall, pier or column, and all bottom surfaces of foundations, shall be horizontal or in the form of steps with horizontal and vertical surfaces.

(2) Where such steps are made in the longitudinal section of the foundation, the portions of the

oundation on adjacent levels shall overlap for a istance at least equal to the vertical thickness of the oundation or the difference between adjacent levels, vhichever is greater.

DIFFERENT LEVELS

16. (1) Where the bottom surfaces of foundations n a building are on different levels, or on levels ifferent from those of the foundations of adjoining uildings, the plans of the building submitted for pproval shall, where required by the local authority, nclude sectional elevations showing such variations n level.

(2) Wherever such changes in level occur, dequate provision shall be made for the proper upport of the higher foundation.

PART II

CONSTRUCTION OF FOUNDATIONS

FOUNDATION MATERIAL

17. All foundations below finished ground-level hall be constructed of plain or reinforced concrete, xcept that—

(a) masonry foundations constructed of stone, brick or block shall be permitted, provided that they comply with the provisions of Chapter 5 and, further, with the provisions of section 22; and

(b) structural steel shall be permitted in accordance with the provisions of section 19.

CONCRETE FOUNDATIONS

18. (1) *Plain concrete foundations.*—Concrete in plain concrete foundations shall be proportioned and mixed in accordance with the provisions of Chapter 3.

(2) When flexural calculations are made, a plain concrete foundation shall be designed on the assumption that critical sections are at the face of the wall, pier or column which it supports, and, in a stepped foundation, also at the face of each step.

(3) A foundation referred to in subsection (2) shall be so proportioned that the maximum tensile stress at any critical section will not exceed 0,03 times the design 28-day compressive strength of the concrete, which shall be determined in accordance with the provisions of Chapter 3.

(4) When flexural calculations are not made, the ratio of the vertical thickness of any plain concrete foundation to its maximum projection beyond any face of the wall, pier or column which it supports, and the ratio of the depth to the projection of any step in the cross-section of the foundation, shall be not less than 1,5, if the bearing pressure on the subsoil is not greater than 300 kilopascals.

(5) If the bearing pressure is greater than 300 kilopascals, the ratio specified in subsection (4) shall be increased by a minimum value of 0,1 for each increase of 50 kilopascals or remaining part thereof over 300 kilopascals in the bearing pressure under the foundation.

(6) For plain concrete foundations supporting columns and sleeper-piers, the punching shear stress calculated on the area obtained by multiplying the perimeter of the column or sleeper-pier by the thickness of such foundation shall not exceed 0,06 times the design 28-day compressive strength of the concrete, determined as described in subsection (3).

(7) Plain concrete foundations are permitted to be constructed in accordance with the empirical rules set out in section 22.

(8) *Reinforced - concrete foundations.*—Reinforced-concrete foundations shall be designed and constructed in accordance with the provisions of Chapter 3.

STEEL FOUNDATIONS

19. (1) Structural steel sections used in foundations shall have a concrete cover with a thickness of at least 75 millimetres, and all spaces between adjacent sections shall be filled with concrete, Grade 20.

(2) Except where a foundation comprising structural steel members surrounded by concrete has been specifically designed to act as a reinforced member as a whole, the concrete casing shall not be taken into account in determining the stresses in the structural steel members, which shall be designed in accordance with the provisions of Chapter 3.

(3) Structural steel beams used in a grillage foundation shall rest on at least 200 millimetres of concrete of the grade specified in subsection (1).

FOUNDATION PIERS

20. (1) Foundation piers shall be constructed of concrete or of unreinforced masonry or reinforced brickwork:

Provided that, wherever the eccentricity of the centre-line of its load with respect to the centre-line of a foundation pier exceeds one-sixteenth of the height of the pier or one-tenth of the least lateral dimension, the pier shall be reinforced, and shall be designed and constructed in accordance with the requirements of these by-laws for reinforced concrete or reinforced brickwork.

(2) The height of a plain concrete foundation pier shall not exceed twelve times its least lateral dimension.

(3) When the height of such a pier does not exceed six times its least lateral dimension, the compressive stress therein shall not exceed 0,2 times the design 28-day compressive strength of the concrete.

(4) When the height of the pier exceeds six times but does not exceed twelve times its least lateral dimension, the compressive stress in such pier shall not exceed—

$$\left(1{,}3 - \frac{L}{20D}\right) \times p \quad \text{pascals}$$

where—

L = the height of the pier, in metres,
D = its least lateral dimension, in metres, and
p = the permissible stress for $\frac{L}{D} = 6$, in pascals.

(5) Subject to the provisions of subsections (6) and (7), reinforced concrete foundation piers shall be designed in accordance with the requirements for reinforced concrete columns, and such requirements

shall be determined in accordance with the provisions of Chapter 3.

(6) If the soil provides lateral support, such piers may be designed without reduction of permissible stress on account of slenderness, where the ratio of the effective height, determined as specified for concrete columns, to the least lateral dimension of the pier, does not exceed 18.

(7) Where such ratio exceeds 18, the permissible stress in the pier for such conditions of support from the soil shall be—

$$\left(1{,}5 - \frac{L'}{36D}\right) \times p' \text{ pascals}$$

where—

L' = the effective height of the pier, in metres,

D = its least lateral dimension, in metres, and

p' = the permissible stress for $\frac{L'}{D} = 18$, in pascals.

(8) Wherever the base of any foundation pier is made larger than its shaft, the base of the pier shall have a vertical thickness of not less than 150 millimetres at its edge. In such cases, the effective height of the pier shall be deduced from the height measured from the top of the enlarged base to the underside of the member supported by the pier.

PILING

21. (1) Details of piled foundations shall be submitted for the approval of the local authority as part of the working-drawings provided for in section 14 of Chapter 2, and shall include—

(a) drawings and complete specifications for the piles and the loads which they have been designed to carry; and

(b) if required by the local authority, the design calculations and the methods proposed for driving or constructing the piles.

(2) If deemed necessary by the local authority, tests shall be made, at the owner's expense, to determine whether the piles will safely carry the loads specified.

(3) Complete field records, giving full details of the construction and the placing or driving of the piles, shall be kept for each pile in all piled foundations by the person constructing such foundations.

(4) Such records shall be available for inspection by the local authority at all reasonable times.

EMPIRICALLY CONSTRUCTED FOUNDATIONS

22. (1) In any case where the local authority is satisfied, from a knowledge of the subsoil conditions in the locality within which a proposed building is to be situated, or from experience of the behaviour of buildings in such locality, that it would not endanger a proposed building to do so, it may permit the erection of such building without a site investigation in terms of section 2.

(2) Unless the local authority specifically calls for a site investigation in terms of section 2, buildings may be erected without such an investigation in cases where—

(a) the proposed building is a dwelling-house not exceeding a height of two storeys; or

(b) the proposed building is a single-storey building, the supporting walls of which do not exceed 4 metres in height.

(3) Buildings falling within the description contained in subsection (2) may be built on foundations constructed in accordance with the empirical rules contained in subsections (4) to (7).

(4) Concrete foundations shall so be constructed that—

(a) the foundations under sleeper-piers shall be not less than 450 millimetres either in length or in breadth, and the width of foundations under sleeper-walls shall be not less than 300 millimetres, and the vertical thickness of such foundations shall be not less than 100 millimetres;

(b) the vertical thickness of other foundations shall be—

(i) not less than 200 millimetres for walls of 200-millimetre thickness and over;

(ii) not less than 150 millimetres for walls of less than 200-millimetre thickness;

(c) the width of foundations under walls, other than sleeper-walls, shall be not less than the thickness of the wall plus twice the vertical thickness of the foundation.

(5) For the purposes of subsection (4)—

(a) the thickness of the wall shall be measured just above the ground-floor level, except where the foundation wall is higher than 1,5 metres, in which case the thickness of the wall shall be measured just above the foundation; and

(b) the thickness of a cavity-wall shall be regarded as the sum of the thicknesses of the leaves of such a wall.

(6) Masonry foundations constructed with stone, brick or solid concrete blocks shall be permitted:

Provided that the local authority may require that any such foundations be built on an approved bed of concrete.

(7) Masonry foundations shall comply with the following requirements—

(a) such foundations for columns or sleeper-piers shall be permitted only on rock or on coarse sand or compact gravel;

(b) the vertical thickness shall be not less than 225 millimetres and not less than twice the maximum projection from the face of the wall, column or pier being supported, whichever is the greater, exclusive of any bed of concrete which may have been provided;

(c) the lateral dimensions of foundations under sleeper-piers and walls shall be as given for concrete foundations in paragraph (a) of subsection (4);

(d) the width of other foundations shall be—
  (i) for single-storey buildings, not less than the thickness of the wall plus 150 millimetres; and
  (ii) for double-storey dwellings, not less than twice the thickness of the wall;
(e) when such a foundation is stepped in cross-section, the height of any step shall not exceed 225 millimetres and the projection of any step shall not exceed half the height of the step;
(f) the mortar used shall be not weaker than class A or class B, as specified in Chapter 5.

PRE-CONSTRUCTIONAL TERMITE-PROOFING

23. All pre-constructional termite-proofing shall comply with C.A.S. No. C.A. 7.

SCHEDULE (*section 2*)

REQUIRED METHOD OF RECORDING SOIL PROFILES

1. Soil profiles recorded on the building site as required by section 2 shall be recorded as specified in this Schedule.

INFORMATION ON SOIL PROFILES

2. Every soil profile shall be recorded from data obtained from a freshly excavated trial hole carried to a depth sufficient to ensure that the whole depth of subsoil which will be affected by the building has been adequately examined. Each stratum in any profile shall be described in terms of colour, consistency, soil structure and soil type. The level of the permanent water-table and of any perched water-table which may be present, and the date on which the examination is made, shall be recorded on each profile.

CLASSIFICATION AND DESCRIPTION OF SUBSOILS TO BE GIVEN IN SOIL PROFILES

3. The following standard terminology and descriptions shall be used in all soil profile records—

(a) *Soil colour.*—Soil colour shall be described by comparison with standard colours given in the Munsell* *Soil colour charts* or, alternatively, in the Burland† *Colour chart*. Two colours should be recorded for each stratum—
  (i) the colour of a slurry of the consistency of thick cream rubbed with water on the palm of the hand; and
  (ii) the colour of the natural soil, as observed in the freshly cut profile;

(b) *Consistency.*—The soils shall be described as falling into either the cohesive or the non-cohesive (granular) group, and shall be further described within each group according to consistency (a measure of the hardness of the soil in its natural state) into one of the grades set out in the Table, in which the moulding referred to means the moulding of a fresh sample taken from a trial hole and the freshly exposed surface referred to is the surface within a trial hole;

(c) *Soil structure.*—Soil structure, which is a description of the jointing condition in the natural soil, shall be recorded as one of the following typical structural forms—
"intact" indicates an absence of fissures or joints;
"fissured" indicates the presence of random closed joints. These are frequently stained with iron and manganese oxides. When cut with a pick, the soil tends to break along these joints;
"slickensided" indicates the presence of more or less continuous joints, which are striated and highly polished;
"shattered" indicates fissures in which joints have opened up and are filled with air. The soil fragments are usually stiff or very stiff, and break out in a cubical or granular fashion when the soil is cut with a pick. Generally the fragments break down with difficulty when wetted and worked in the hands;
"micro-shattered" means shattered extensively, with the shattered fragments of the size of coarse sand grains. When micro-shattering is well developed, and the soil is cut with a pick, it appears granular, but these grains break down into a clay or silt, or some combination of clay and silt, when rubbed with water on the palm of the hand. Micro-shattering is a sign of potential heaving conditions;
"laminated" or "foliated" indicates that the soils show the laminated or foliated structure of the parent rock from which they are derived;

(d) *Soil type.*—Soil type, which is a description mainly according to the grain-size of the soil, shall be recorded as rock, or as one of the types set out below. Most natural soils are a combination of one or more of the types described, and in any description of such a soil the adjective is used to denote the lesser type; for example, a silty clay is a clay with some silt, whereas a silt-clay has approximately equal portions of both types. The basic classification of soils into gravels, sands, silts, and clays relates to the drainage characteristics of the soils. All clays and most silts are slow-draining soils, giving rise to time-effects in soil behaviour which are of great importance, particularly as regards the resistance of the soil in shear. Consequently (depending upon the type of

* Munsell Colour Company, Inc. Baltimore 2, Maryland, U.S.A. (1954).

† Burland, J. B. *Transactions South African Institution of Civil Engineers* (August 1961). Charts are available for purchase from the Standards Association of Central Africa.

engineering structure under consideration), differences in the behaviour of silty clay, silt-clay or clayey silt are likely to involve only differences in time-effects;

"fresh rock" means a natural geological material which has not been weathered, and normally requires blasting for breaking in excavation; alternatively, where the rock is intact, a solid core can be recovered by diamond drilling with a single-tube core barrel, using water as a drilling-fluid;

"decomposed rock" means natural geological material which can be excavated without blasting; a solid core cannot be recovered by drilling with a single-tube core barrel using water as a drilling-fluid; coring requires sophisticated drilling practices. Such decomposed rock should be classified and described as a soil;

"boulders" means fragments of rock larger than 150 millimetres in cross-sectional dimension. State whether these are rounded, subangular or angular. Record the rock types and range of sizes. State whether there is a matrix in the voids between the boulders. Describe this matrix as a soil, and state whether or not it fills the voids between the boulders. (Where the volume of matrix material is significantly greater than that of the "minimum voids", the engineering behaviour of the soil will be determined by this matrix, and not by the boulders.);

"gravel" means fragments of rock measuring between 150 millimetres and three millimetres across. The description shall follow that for boulders as above; particular care shall be given to the description of the matrix;

"sand" means discrete particles which are clearly visible to the naked eye. Sand is clearly distinguished by these gritty particles, which do not break down when rubbed with water on the palm of the hand;

"silt" means soil having particles which are smaller than 60 micrometres but larger than two micrometres. In general, silts are very fine, discrete particles which may be felt when rubbed with water on the palm of the hand. When a small quantity of the wetted soil is placed on the tongue, the particles can be clearly distinguished against the teeth. When moulded with water into a ball, it exhibits dilatancy;

"clay" means soil having particles smaller than two micrometres. In general, the particles are flaky, and, when rubbed on the palm with water, this soil has a soapy or greasy feel. There is no feel of grittiness when a small quantity of the soil is placed between tongue and teeth.

SUBSURFACE WATER CONDITIONS

4. (1) "The water-table" is that level or those levels in the soil where the water in pores of the soil is at atmospheric pressure.

(2) "The permanent water-table" is the water-table which persists throughout the seasons of the year with only minor fluctuations of level.

(3) "A perched water-table" is a water-table which is only temporarily present in the soil: it will disappear and sometimes reappear, depending upon seasons or drainage conditions of the site.

TABLE

CONSISTENCY GRADES OF SUBSOILS

1	2
COHESIVE SOILS	NON-COHESIVE SOILS
(i.e. silts and clays and combinations of silts and clays with sand and gravel, generally slow-draining)	(i.e. gravels and clean sands, generally free-draining)
"Very soft" means easily moulded in the fingers; a freshly exposed surface shows distinct heel-marks when stood upon	"Very loose" means very easily excavated with a spade; having a dry density less than about 1 450 kilograms per cubic metre
"Soft" means can be moulded in the fingers with strong pressure; a freshly exposed surface shows faint heel-marks when stood upon	"Loose" means having small resistance to shovelling or to penetration by hand bar; having a dry density of about 1 450 to 1 600 kilograms per cubic metre
"Firm" means very difficult to mould in the fingers, and difficult to cut with a hand spade	"Medium dense" means having considerable resistance to shovelling or to penetration by hand bar; having a dry density of about 1 600 to 1 750 kilograms per cubic metre
"Stiff" means cannot be moulded in the fingers, and cannot be cut with a hand spade, and requiring hand picking for excavation	"Dense" means having very high resistance to penetration by hand bar and requiring a hand pick for excavation; having a dry density of about 1 750 to 1 900 kilograms per cubic metre
"Very stiff" means very difficult to excavate with a hand pick, and requiring a pneumatic spade for economic excavation	"Very dense" means having high resistance to excavation by hand picking and requiring a pneumatic spade or pick for economical excavation; having a dry density of 1 900 kilograms per cubic metre, or more

CHAPTER 5

MASONRY AND WALLING

ARRANGEMENT OF SECTIONS

PRELIMINARY

PART I

ERECTION OF MASONRY IN BUILDINGS

PART II

GENERAL REQUIREMENTS FOR EMPIRICAL MASONRY CONSTRUCTION

PART III

REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY AND CONCRETE

A. BRICK BEARING-WALLS

B. BRICK NON-BEARING WALLS

C. MASONRY OTHER THAN BRICK

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"adequate lateral support", in relation to a wall, means a cross-wall complying with the requirements of section 19, or a structural member which is designed to resist the overturning moments and lateral forces on the wall supported, or a column, buttress, frame or other construction which is, in the opinion of the local authority, adequate to do so;

"admixture" means a material other than aggregate, cement or water, added in small quantities during the mixing of concrete to produce some desired modification in one or more of the properties of the concrete;

"aggregate" means a material which is mixed with cement and water to provide bulk in concrete or mortar;

"coarse aggregate" means aggregate complying with the provisions of subsection (8) of section 5;

"fine aggregate" means aggregate complying with the provisions of subsections (5) and (6) of section 5;

"light-mass aggregate" means aggregate having a density of not more than 1 000 kilograms per cubic metre, measured loose and dry;

"ordinary aggregate" means aggregate other than light-mass aggregate;

"ashlar masonry" means masonry composed of rectangular units of natural or cast stone which have larger exposed face-areas than those of blocks, and have accurately sawn, dressed, cast or squared beds, and are so laid in mortar that the joints are at all points not less than 3 millimetres and not more than 8 millimetres in thickness;

"balustrade" means a row of columns crowned by a railing erected along the edge of a balcony or gallery to prevent persons from falling;

"bearing-plate or padstone" means a block of material, placed under the end of a roof-truss, girder or beam, to distribute the load;

"block" means a masonry-unit used in building, and possessing dimensions such that it can be laid only in a non-bonded or stretcher bond pattern;

"cellular blocks" means blocks which are similar to hollow blocks but which have the cavities closed at one end. The solid cross-sectional area of a cellular block shall comprise at least 45 *per centum* of the total cross-sectional area of that block;

"hollow blocks" means blocks which—

(a) contain at least one large hole or cavity of a size such that the solid material in the block constitutes between 48 *per centum* and 75 *per centum* of the total volume of the block calculated from its over-all dimensions; or

(b) when used in a wall, or in a leaf of a cavity wall, forms internal cavities which have a total area, in the horizontal plane, of more

than 25 *per centum* of the horizontal cross-sectional area of the wall or leaf of the cavity wall;

"solid blocks" means blocks in which the solid material is not less than 75 *per centum* of the total volume of the block calculated from over-all dimensions;

"bond", as applied to—

(a) masonry, means a systematic arrangement of bricks, blocks or other building-units in courses, which will enable them to act together as a whole in sustaining loads, and "to bond" has a corresponding meaning;

(b) reinforcement, means the shear stress developed at the interface between a reinforcing-bar embedded in concrete or mortar and the surrounding concrete or mortar when an axial force is applied to the bar, the bond stress tending to restrain relative displacement of the bar;

"brick" means a masonry-unit used in building and possessing dimensions such that it can be laid with the use of any acceptable masonry bonding pattern;

"building-unit" means a brick or block of clay, concrete, calcium silicate, soil-cement or other material, of regular shape, or a natural stone of rectangular or irregular shape and size, used in the construction of masonry or walling;

"buttress" means a vertical member bonded into a wall for the purpose of giving it lateral support. It resembles a pier but does not extend to the full height of the wall;

"cast stone" means a reconstructed or artificial stone consisting of a mixture of cement and aggregate;

"column" means a vertical load-bearing member, the width of which, measured at right angles to its thickness, does not exceed four times the thickness, and which is not bonded into a wall;

"concrete" means a mixture of cement, aggregate and water, with or without admixtures, which has, or will, set to form a hard, cohesive agglomeration;

"light-mass concrete" means concrete having a density less than 1 600 kilograms per cubic metre after it has been cured and become air-dry;

"no-fines concrete" means concrete containing not more than 10 *per centum* fines of the total mass of aggregate;

"normal concrete" means concrete containing both fine and coarse aggregate;

"corbel" means a projection built out from the face of a wall to form a load-bearing surface;

"cornice" means a horizontal projection which crowns or finishes a wall or any portion of a wall or any other architectural feature;

"empirically constructed" means constructed or intended to be constructed otherwise than in accordance with a design based on calculation of the dimensions required to limit, to the values set out in sections 67 to 74 or in section 78, the stresses which could occur in the masonry or walling, and "empirical construction" shall have a corresponding meaning;

"foundation-footing" means a foundation, not being a pile, supporting a structural member, and usually wider than the structural member;

"height of wall or column"—

(a) "effective height" of a wall or column, means the height of a wall or column assumed for calculating its slenderness ratio;

(b) "storey-height" of a wall or column, in any storey, means the height of a wall or column measured from the under-side of the floor construction of such storey to the under-side of the floor construction immediately above, or, where there is no floor above, to the mean height of the gable, where the wall is a gable-wall, or to the under-side of the roof construction above, whether this be a wall-plate, girder or other framework:

Provided that—

(i) where such wall or column is not laterally restrained by the floor, its storey-height shall be measured from the top of the foundation; and

(ii) where a column rests centrally on a foundation-wall which is at least 100 millimetres thicker than the column, the storey-height of such column may be measured from the top of such foundation-wall;

(c) "total height" of a wall or column means the height measured from the top of the foundation-footing, girder or slab on which the wall or column rests to the top of the wall or column, whether or not this is above the roof:

Provided that the total height of a gable-wall shall be taken as its mean height;

"length of wall"—

(a) "effective length of wall" means the length of a wall assumed for calculating its slenderness ratio;

(b) "unbroken length of wall" means a length of wall which is not broken into by openings or by chases or recesses which are regarded as openings in terms of section 17;

(c) "unsupported length of wall" means the length of the wall measured between the inner faces of adequate lateral supports or from the face of such a lateral support to a free end;

"light-mass construction" means construction in which the walls in any storey and in all storeys above are built entirely of bricks or blocks having a density less than 1 600 kilograms per cubic metre of gross volume, or light-mass concrete;

"masonry" means an assembly of non-combustible building-units bonded together;

(a) "masonry construction" means construction of masonry or of masonry in combination with other materials;

(b) "solid masonry" means masonry in which the building-units are laid with the joints between such units filled with mortar, and without forming cavities between units;

"masonry-unit": see "building-unit";

"mortar" means a mixture of cement or lime, or both, with fine aggregate and water;

"pier" means a vertical masonry member bonded into a wall and of the same height as the wall;

"sleeper-pier": see "sleeper-wall" or "sleeper-pier";

"restrained"—

(a) "a column fully restrained at the top" means a column adequately restrained at the top from movement in position or direction in the plane being considered;

(b) "a wall fully restrained at the top" means a wall supporting a solid concrete floor or concrete roof or concrete beams bonded to the wall, or a wall anchored to a precast concrete floor as specified in section 25;

(c) "a wall moderately restrained at the top" means a wall supporting a timber floor, and anchored to it as specified in section 25, or a wall anchored to, and restrained by, roof-trusses or a roof or roof-components, to the satisfaction of the local authority;

"roof"—

(a) "flat roof" means a roof which is not a pitched roof;

(b) "heavy roof" means a roof construction, including framing, purlins and covering, having a mass of more than 35 kilograms per square metre of horizontal area;

(c) "pitched roof" means a roof designed and constructed as a framed roof supported on the external walls of the building;

"rubble"—

(a) "random rubble" means masonry composed of roughly shaped or unshaped stones laid without regularity of coursing;

(b) "squared rubble" means masonry composed of roughly squared stones arranged to form well-defined horizontal joints;

"sleeper-wall" or "sleeper-pier" means a foundation-wall or -pier erected between other foundation-walls or -piers to provide an intermediate support to the lowest floor, and having no corresponding wall or pier directly above it;

"slenderness ratio" means a ratio between the dimensions of a wall or a column, as prescribed by subsections (1) and (2) of section 66, which is used in determining the permissible stresses;

"soil-cement" means a mixture of natural soil and cement compacted, when moist, into a structural material;

"strength" of a building-unit or material means the average strength of a sample of the unit or material measured as specified in the relevant specification or, if there is no specification applicable, as described by the testing authority;

"thickness", applied to a wall, means the actual thickness;

"effective thickness of a wall" means the thickness of a wall assumed for calculating its slenderness ratio, as set out in subsections (5) to (10) of section 66;

"veneer" means the facing attached to a veneered wall;

"heavy veneer" means a veneer having a mass of not less than 75 kilograms per square metre, exclusive of the backing-mortar;

"light veneer" means a veneer having a mass of less than 75 kilograms per square metre, exclusive of the backing-mortar;

"masonry veneer facing" means a veneer facing composed of masonry building-units;

"wall"—

(a) "balustrade-wall" means a wall erected in place of a balustrade, and serving the same purpose;

(b) "basement-wall" means an external wall of a building, enclosing usable floor space of a basement, and either wholly or partly below ground-level;

(c) "bearing-wall" means a wall which supports any vertical load in addition to its own mass and the mass of a veneer;

(d) "cavity-wall" means a wall in the form of two walls (called leaves), built side by side, tied to each other, and separated by a cavity, either left open as an air space or filled with non-load-bearing material;

(e) "cross-wall" means an intersecting, bearing or non-bearing wall which may be considered to limit the unsupported length of the wall which it intersects;

(f) "curtain-wall" means a non-bearing external masonry wall of a height of one or more than one storey, and which is laterally supported, either by piers or by the vertical and horizontal structural members of the frame of a building, and which may be supported over part of its thickness but not its full thickness on the slabs or the beams of such frame, and which carries no load other than its own mass and the mass of veneer, if any, and resists no force other than wind force;

(g) "external wall" means a wall separating the interior from the exterior of a building;

(h) "faced wall" means a wall in which a facing and a backing are intended to exert a common reaction under load, and are built up simultaneously;

(i) "foundation-wall" means a bearing-wall situated below the lowest floor-level;

(j) "free-standing wall" means a wall without adequate lateral support at either end or along the top;

(k) "internal wall" means a wall wholly within a building;

(l) "masonry breast-wall" means a masonry wall, or portion of such wall, which extends from the floor on which it is built to the sill of a window, and which extends for a length greater than 32 times its effective thickness;

(m) "non-bearing-wall" means a wall which supports no vertical load other than its own mass and the mass of veneer, if any;

(n) "panel-wall" means a non-bearing external wall, built between columns, walls or piers, and not exceeding one storey in height;

(o) "parapet-wall" means a wall, or that part of a wall, which is entirely above the abutting upper surface of the roof;

(p) "partition-wall" means a non-bearing internal wall which is employed solely for the purpose of subdividing any storey of a building into sections;

(q) "retaining-wall" means a wall intended to resist the lateral displacement of materials other than liquids;

(r) "rubble stone wall" means a wall constructed of random rubble or squared rubble;

(s) "skin wall" means a wall protecting a vertical waterproof or damp-proof layer;

(t) "sleeper-wall"; see "sleeper-wall" or "sleeper-pier";

(u) "solid wall" means a wall other than a cavity-wall;

(v) "veneered wall" means a wall which has a facing and a backing which are not intended to exert a common reaction under load;

(w) "wing-wall" means a wall which has adequate lateral support at one end only;

"0,3 *per centum* proof stress" means the tensile stress at which a non-proportional elongation equal to 0,3 *per centum* of its original length occurs in a material under load.

INTERPRETATION OF CERTAIN TERMS

2. (1) Wherever "resist" or "sustain" occurs in this Chapter, it shall mean resist or sustain, as the case may be, at the stresses permitted in this Chapter.

(2) Wherever "wall" or "walls" occurs, it shall not mean a veneered wall or walls, unless stated to the contrary.

(3) Wherever the thickness of a wall is mentioned, it shall mean the actual thickness, unless the effective thickness is stipulated.

DIMENSIONS SUBJECT TO TOLERANCES

3. Where the minimum dimension of a wall, a pier or a column built of masonry is given in millimetres in this Chapter, then, to make allowance for the tolerance permitted in the size of standardized building-units, such minimum dimension shall be deemed to be subject to the tolerance set forth in Table I.

TABLE I

DIMENSIONS SUBJECT TO TOLERANCES

1	2
Dimension in millimetres	Tolerance (minus) in millimetres
50	3
65	3
100	3
215 or greater	5

PART I

ERECTION OF MASONRY IN BUILDINGS

APPLICATION OF REGULATIONS TO MASONRY AND CONCRETE WALLING

4. (1) All buildings composed of masonry construction, and all masonry and concrete walls, shall be erected in accordance with the provisions of this section.

(2) All materials and building-units shall comply with the requirements of section 5.

(3) The construction shall be executed in accordance with the general requirements of sections 6 to 38, and, in addition, every part of the construction shall be constructed either—

(a) in accordance with the general requirements for empirical construction set out in sections 39 to 43, and the particular requirements for empirical construction set out in sections 44 to 62, applicable to the building-units or materials used; or

(b) in accordance with the provisions of sections 63 to 82 for the calculated design of masonry construction:

Provided that—

(i) where no calculations are submitted for approval in connexion with the design of any masonry building, or any particular portion of such building, it shall be assumed that such building or portion is intended to comply with the requirements for empirical construction set out in sections 39 to 62; and

(ii) the local authority shall be entitled to require that—

A. walls and piers which support any cantilevered construction, or any concentrated load other than the loads from lintels or from timber floor-joists or ceiling-joists, or from timber rafters or trusses; and

B. any portion of the building which the local authority considers would otherwise be dangerous;

shall either be designed in accordance with the provisions of sections 63 to 82 for the calculated design of masonry construction or be constructed of other materials in accordance with these by-laws.

(4) All walling of materials other than masonry or concrete shall comply with the requirements set out in section 7 for unspecified materials.

REQUIREMENTS FOR MATERIALS AND BUILDING-UNITS

5. (1) *Materials not provided for in these by-laws.*—Subject to the provisions of section 7, building materials not provided for in these by-laws may be used in walling if they comply with the terms of a departure certificate or authorization granted in terms of Part VII of Chapter 2.

(2) *Second-hand materials.*—Second-hand building materials may not be used unless such materials—

(a) are sound; and

(b) comply with the requirements of these by-laws; and

(c) have been thoroughly cleaned and all adhering other materials which would interfere with their intended function removed.

(3) *Cement.*—Cement used in masonry shall comply with the requirements of C.A.S. No. A46:

Provided that cement not so complying, but, nevertheless, complying with a specification acceptable to the local authority, may be used.

(4) *Lime.*—Lime used in masonry shall comply with the requirements of C.A.S. No. A15, Building limes.

(5) *Fine aggregate* (*sand*).—Fine aggregate used in mortar shall comply with the requirements of C.A.S. No. A34, Aggregates for concrete, and, in addition—

(a) at least 97 *per centum* of any sample measured by mass, shall pass through a 2,36-millimetre sieve; and

(b) the percentage which passes a 75-micrometre sieve when tested in accordance with C.A.S. No. A33, Methods for sampling and testing of mineral aggregates, sands and fillers, shall not exceed 7,5 *per centum*.

(6) Fine aggregate in concrete shall comply with the requirements of C.A.S. No. A34.

(7) *Water.*—Water for use in masonry or concrete walling shall be clean and free from clay and silt and such amounts of oil, acid, alkali or organic or other matter as, in the opinion of the local authority, will seriously impair the strength and durability of the masonry or walling.

(8) *Coarse aggregate* (*stone*).—Coarse aggregate for concrete shall comply with the requirements of C.A.S. No. A34.

(9) *Standard building units.*—The building-units listed in this subsection, when used in the construction of buildings, shall comply with the requirements of the standard specification applicable to the unit concerned, and, in addition, shall comply with the other provisions of this Chapter.

Unit	*Specification*	*Title*
Cement bricks	C.A.S. No. A41	Cement bricks
Clay bricks	C.A.S. No. A35	Burnt clay building bricks and blocks
Sand lime bricks	C.A.S. No. A8	Sand lime bricks
Concrete blocks (solid, hollow and light-mass)	C.A.S. 119	Precast concrete masonry blocks
Clay blocks (hollow)	C.A.S. No. A35	Burnt clay building-bricks and blocks
Sand-cement blocks	C.A.S. No. A10	Precast sand-cement blocks
Glass blocks (hollow)	B.S. 1207	Hollow glass blocks

(10) Hollow glass blocks which are 298,5 millimetres square in elevation, but which in other respects comply with B.S. 1207, shall also be permitted.

(11) *Stone for masonry.*—Rubble stone shall have a "crushing value" (10 *per centum* fines test) when tested in accordance with C.A.S. No. A33 of not less than 75 kilonewtons.

(12) *Soil-cement blocks and bricks.*—Soil-cement blocks and bricks, when tested in accordance with C.A.S. No. A41, shall comply with the following requirements—

(a) the average compressive strength at an age of 28 days shall be not less than 2,8 megapascals;

(b) the increase in mass after immersion in water for 24 hours shall not exceed 12 *per centum* of the dry mass;

(c) the linear expansion after immersion in water for 24 hours shall not exceed—

(i) 0,05 *per centum* where, in the opinion of the local authority, cracking of the walls cannot be tolerated;

(ii) 0,1 *per centum* where the blocks or bricks are to be used only in internal walls.

EXTERNAL WALLS TO BE WEATHERPROOF

6. (1) Every external masonry or concrete wall of a habitable portion of a building shall be capable of withstanding the artificial rain test described in the Second Schedule and shall be—

(a) constructed of masonry building-units so as to be at least 200 millimetres thick; or

(b) constructed of plain, normal concrete at least 200 millimetres thick or of reinforced concrete at least 100 millimetres thick, and be treated if necessary; or

(c) constructed of no-fines concrete at least 200 millimetres thick; or

(d) of such lesser thickness as is permitted by this Chapter for the relevant conditions.

(2) Every external wall of a habitable portion of a building which is not of masonry or concrete shall be weatherproof to the satisfaction of the local authority.

WALLING OF UNSPECIFIED MATERIALS

7. (1) For the purposes of this section—

"structural damage" shall mean a cracking, spalling or crumbling of the surface of the wall which is readily visible to the naked eye. The fracture of glass in adjacent windows or

damage to applied finishes shall not be deemed to be structural damage to the wall;

"structural failure" shall mean collapse of the wall or a portion of the wall, or holing of the wall;

"load factor" shall mean the quotient found when that load which causes the first signs of structural damage or structural failure, as the case may be, is divided by the maximum load which the walls are designed to support.

(2) If the walls of a building are to be constructed of materials or building-units not specified in this Chapter, the local authority may call for tests to be conducted, or a report submitted, according to the provisions of Chapter 2, and shall prohibit the use of such materials or units unless the results of the tests demonstrate, or the report shows, that such walls comply with such of the following requirements as are, in the opinion of the local authority, applicable to them—

(a) when loaded with static loads, the walls shall provide load factors for structural damage and for structural failure not less than those considered satisfactory by the local authority for the material and method of construction concerned;

(b) the walls shall withstand the impact test set out in the First Schedule;

(c) the deflection, under design load, at the centre of walls which are to be plastered shall not exceed 1/360 of the distance between lateral supports, and that of walls which are not to be plastered shall not exceed 1/240 of such distance;

(d) when tested for moisture penetration as described in the Second Schedule, walls shall not show visible dampness on the inside surface to the extent specified within a lesser period than set out in the Table in that Schedule for the appropriate conditions;

(e) the construction shall be shown to be, or be assessed as being—

(i) durable; and

(ii) stable under variations in load, and under variations in temperature and moisture content which are due to climatic conditions.

SUPPORT OF WALLS

8. (1) Every wall not supported by another wall or a structural member shall be supported on a foundation complying with the provisions of Chapter 4, except where the local authority permits the construction of a wall on solid rock after having satisfied itself that the safety of the building will not be endangered by the omission of a foundation.

(2) Except as provided in section 21, no wall shall be allowed to carry a wall thicker than itself, and where, in a building, walls are interrupted by floor-slabs, every wall in each storey shall be located vertically over the wall below, unless full provision is made in the design of such building to support a wall in another position.

(3) Lateral stability to a building as a whole shall be provided by cross-walls or by other means which are to the satisfaction of the local authority.

(4) Empirically constructed walls other than wing-walls, free-standing walls and retaining-walls shall have adequate lateral supports at each end.

(5) Empirically constructed external walls shall be either moderately or fully restrained at the top in each storey of a building.

(6) Empirically constructed gable-walls shall be securely anchored to the roof along the top of the gable, and, where necessary, in the opinion of the local authority, provision shall be made at such anchorage to accommodate movement of the roof due to expansion or contraction of the roof.

LOADING OF MASONRY MEMBERS

9. (1) Where floor-slabs or other slabs or beams are supported by masonry or plain concrete walls, piers or columns, no loads other than the normal surface finishes shall be superimposed upon such supporting members, unless adequate falsework is left or placed under them to carry such superimposed loads without undue deflection, until—

(a) such time as the mortar or concrete in such walls, piers or columns has attained the minimum compressive strength at 28 days applicable to the class of mortar or concrete employed, as specified in section 13 or 14, respectively; or

(b) failing tests to demonstrate such strength referred to in paragraph (a), the following periods have elapsed after the mixing of the mortar or concrete used in the last portion of such walls, piers or columns to be constructed—

(i) for class D mortar, 28 days;

(ii) for other mortar and concrete made with—

A. Portland cement other than high early strength Portland cement, 28 days;

B. high early strength Portland cement, 5 days.

TABLE II

LOADING OF MASONRY MEMBERS:
cementitous materials

1	2
Period	Maximum height of fill
Less than 3 days	Nil
3 days	One-third full height* as specified in section 46
The required period†	Full height*

* "full height" means the height of fill for which a wall acting as a retaining wall has been designed, or, for an empirically constructed foundation or basement wall, means the height specified in section 46 for such brick foundation or basement walls;

† "required period" means—

(a) the period required to achieve the design strength of the mortar or concrete or the required strength thereof as set out in section 13 or 14, as the case may be; or

(b) the period set out above in this section for the class of mortar or concrete concerned, before walling supporting slabs or beams is permitted to receive its full load;

whichever is the lesser.

(2) Fill or back-fill shall not be placed against any wall until the period set out in Table II for the relevant maximum height of fill has elapsed after the completion of the wall.

LOAD-BEARING SURFACES

10. (1) Except as specified in subsection (2), all building-units in masonry construction shall be laid in horizontal courses, with their load-bearing surfaces horizontal.

(2) The exceptions to subsection (1) are—

(a) stones in random rubble stone walls;

(b) stones in natural stone bearing-walls, not being random rubble stone walls, in which case the beds of the stones shall be approximately level for a minimum distance of 120 millimetres back from the face of the wall;

(c) building-units which are permitted to be built to a pattern not forming horizontal courses:

Provided that, for the purposes of section 17, the portion of the wall formed by such units shall be regarded as either an opening or a recess, depending on whether or not such portion extends to a thickness greater than one-third of the thickness of the wall;

(d) cases where the local authority is satisfied that the design requires the bedding-planes to be inclined to the horizontal.

BOND

11. (1) Except in rubble stone walls, the vertical joints in successive courses in masonry walls shall break joint to the extent of at least a quarter of the length of a building-unit.

(2) Whenever the thickness of a solid wall of bricks or blocks is composed of more than one building-unit, either wall-ties shall be built into such wall to bond it together or a bond shall be employed which provides a complete course of headers to every five or less than five courses of stretchers, or the equivalent area of headers evenly distributed over the face area of the wall.

(3) The clear distance between any header or tie and its nearest neighbour in any direction shall not exceed the following value—

(a) for bricks—

(i) 450 millimetres, measured vertically; or

(ii) 900 millimetres, measured horizontally;

(b) for blocks—

(i) 600 millimetres, measured vertically; or

(ii) 900 millimetres, measured horizontally.

(4) Where wall-ties are employed to bond together the leaves of a wall, both the ties and their spacing shall comply with the requirements of section 33, whether the leaves are separated by a cavity or not.

(5) *Bond-stones.*—In walls built of natural stone, bond-stones shall be evenly distributed over the face areas of the wall, and shall be provided on both sides to such an extent that the area of the bond-stones on each side, measured in the plane of the wall, is not less than one-sixth of the face area of the wall.

(6) The bond-stones referred to in subsection (5) shall, in the case of rubble stone walls, which are not retaining-walls, be built into the thickness of the wall to a depth of not less than 320 millimetres or the thickness of the wall, whichever is the lesser, and, in the case of rubble stone retaining-walls, the bond-stones shall extend far enough from each face into the thickness of the wall to overlap the adjacent bond-stones extending from the opposite face by not less than 100 millimetres.

(7) In the case of ashlar masonry walls, bond-stones shall extend throughout the full thickness of the wall.

(8) The maximum distance between adjacent bond-stones on the same side of the wall, centre to centre, in both the horizontal direction and the vertical direction, shall be 1 metre for ashlar walls or rubble stone walls not more than 600 millimetres thick and 750 millimetres for rubble stone walls thicker than 600 millimetres.

(9) Walls shall be properly bonded by a masonry bond to piers and buttresses, and, except where walls are bonded to cross-walls by anchors in accordance with section 19, to cross-walls.

WORKMANSHIP

12. (1) Except where the local authority considers it to be unnecessary or inadvisable, all walls shall be plumb, and shall be adequately braced during construction.

(2) Except for concrete and soil-cement building-units, which shall be kept in a dry condition, all masonry building-units shall be thoroughly wetted with water immediately before being laid.

(3) Except in rubble stone walls, and where permitted by the local authority, all masonry building-units shall be laid in mortar, and the mortar joints shall be filled, and shall be not less than 5 millimetres and not more than 20 millimetres in thickness.

(4) No portion of a masonry wall shall be built up during building operations more than 1 metre above the top of any other portion of such wall.

MORTARS

13. (1) *Mortars: classification.*—Except where gypsum is required by section 36, or where another mortar is permitted under subsection (8), mortar shall be of one of the classes specified in Table III to subsection (7), and shall otherwise comply with the requirements of this section relating to its class. The use of "artificial plasticisers" may be employed as an additive to cement mortars with the approval of the local authority.

(2) *Composition: class A.*—Class A mortar shall be composed of Portland cement together with fine aggregate in the proportions specified in subsection (7). Plastic hydrated lime to the extent of no more than 25 *per centum* of the dry cement by volume may be added to increase the workability. Such mortar shall be used within 60 minutes of the time when the cement was added to the mix.

(3) *Composition: classes B and C.*—Classes B and C mortars shall be composed of Portland cement

together with fine aggregate in the proportions specified in subsection (7), and may include either lime-putty or hydrated lime.

(4) If normal lime is used in class B or class C mortar—

(a) the mortar shall not be used before it has been allowed to mature for at least 24 hours after the lime has been mixed with the fine aggregate; and

(b) the mortar shall be used within 60 minutes of the time when the cement was added to the mix.

(5) *Composition: class D.*—Class D mortar shall be composed of lime-putty or hydrated lime and fine aggregate in the proportions specified in subsection (7), and Portland cement to the extent of not more than 25 *per centum* by volume of the dry lime may be added to increase the strength.

(6) If normal lime is used in class D mortar, the mortar shall be allowed to mature before being used for at least 24 hours after the lime has been mixed with the fine aggregate.

(7) *Proportions and required strength of mortars.*—When tested in accordance with the Third Schedule, mortars of the classes specified in Table III shall have the minimum compressive strength shown in that Table.

TABLE III

MIXING PROPORTIONS AND STRENGTHS OF MORTARS

1	2	3	4	5
Class	Limiting proportions measured by volume			Minimum required compressive strength, in megapascals (at 28 days)*
	Cement	Lime	Fine aggregate, measured damp and loose	
A	1	0–¼	Not more than 4	14,0
B	1	0–1¼	Not more than 6	6,5
C	1	0–2½	Not more than 9	2,0
D	0–¼	1	Not more than 4½	0,6

* Attention is drawn to the fact that the Third Schedule requires cubes of classes A, B, and C mortar to be stored and tested wet, while those of class D are to be stored and tested dry.

(8) *Special mortars.*—Mortars other than those specified in subsection (1), such as hydraulic lime mortar, may be used where tests have shown them to be satisfactory with regard to strength, soundness and consistency, to the satisfaction of the local authority.

(9) *Permitted uses of mortars.*—Except where the provisions of this Chapter require otherwise, mortars shall be used only as specified in subsections (10) to (13):

Provided that mortar classes of a higher required compressive strength may be used for the purposes permitted for a class of lower required strength, but not vice versa.

(10) Class D mortar may be used—

(a) in a bearing-wall or pier in a single storey building, or in the topmost storey of a building:

Provided that—

(i) such wall shall not be a cavity-wall or a rubble stone wall; and

(ii) such mortar shall not be used in a portion of the wall which is either above the surface of the roof or below the damp-proof course near ground-level, or which is exposed to continual dampness;

(b) in a partition-wall or a curtain-wall or a panel-wall, but not in a retaining-wall or a balustrade-wall or a free-standing wall.

(11) Class C mortar may be used—

(a) in a bearing-wall or a pier:

Provided that such mortar shall not be used in a portion of a wall which is either above the surface of the roof or below the damp-proof course near ground-level, or which is exposed to severe conditions of continual dampness;

(b) in a partition-wall or a curtain-wall or a panel-wall, but not in a retaining-wall or a balustrade-wall.

(12) Class B mortar may be used in bearing-walls, piers and columns, and in partition-walls, curtain-walls, panel-walls, free-standing walls and wing-walls.

(13) Class A mortar may be used in any masonry construction.

(14) *Gypsum mortar.*—Gypsum mortar shall be composed of gypsum and fine aggregate, the volume of which shall not exceed twice that of the gypsum.

(15) In no case shall gypsum be mixed with Portland cement, or be allowed to come into contact with Portland cement or the products thereof within seven days of the time when the Portland cement was mixed with water.

(16) Gypsum mortar shall not be used as mortar with building-units other than gypsum or glass blocks:

Provided that it may be used as internal plaster with any mature building-units.

CONCRETE IN WALLING[1]

14. (1) Concrete used in walls, piers and columns, and in foundations for them, shall, except where otherwise specified, be made, placed and cured in accordance with the requirements of the appropriate Central African standard, and, in addition, shall comply with requirements of the following subsections.

(2) Normal concrete, other than light-mass concrete used in the construction of load-bearing members, shall be mixed in the proportions of one part of cement to not more than nine parts in all, when measured by volume and counted separately before being mixed, of fine and coarse aggregate, and such concrete used in the construction of non-load-bearing members shall be mixed in the proportions of one part of cement to not more than twelve parts

[1] Note that further requirements are set out as follows—
for reinforced-concrete walls and columns, in section 74;
for reinforced-concrete lintels, in section 18;
for unreinforced-concrete walls, in sections 61, 62 and 70.

in all of fine and coarse aggregate, measured in the same way.

(3) Light-mass concrete and no-fines concrete used in bearing-walls shall be made, placed and cured in accordance with the requirements for controlled concrete contained in Chapter 3.

(4) When tested in accordance with the provisions of Chapter 3, the various classes of concrete shall have a cube strength at an age of 28 days of not less than the following—

(a) normal concrete, with ordinary aggregate—
  (i) for load-bearing members, 14 megapascals;
  (ii) for non-load-bearing members, 7 megapascals;
(b) light-mass normal concrete, 3,5 megapascals;
(c) no-fines concrete employing ordinary aggregate, 2,45 megapascals;
(d) no-fines concrete employing light-mass aggregate, 1,75 megapascals.

CONSTRUCTION IN COLD WEATHER

15. No masonry construction shall take place when the temperature at the site of the work is below—

(a) 2 degrees Celsius at a time when the temperature is rising; or
(b) 5 degrees Celsius at a time when the temperature is falling.

USE OF EXISTING MASONRY

16. (1) An existing masonry wall, pier or column may be used in the construction of a building, and in the repair, alteration or enlargement of a building, if it complies with the requirements of these by-laws.

(2) An existing masonry wall which is structurally sound but which is of insufficient thickness for its proposed use may be made thicker by the addition of material similar to that of the existing wall, laid in mortar of the required proportions, if the foundations for the completed structure comply with these by-laws.

(3) The additions or linings referred to in subsection (2) shall be thoroughly bonded to the existing masonry by toothings bonded at least 100 millimetres deep or the full thickness of the lining, whichever is the lesser, into the new masonry, and at least 100 millimetres into the existing masonry.

(4) The toothings referred to in subsection (3) shall be distributed uniformly throughout the area of the additions to the wall, and shall have an aggregate vertical cross-sectional area not less than 15 *per centum* of the total area of that part of the wall thickened by the lining.

(5) Plaster, or adherent coatings which might impair the adhesion, shall be stripped off any wall-surface against which a lining is to be built, and the whole of such masonry surface shall be cleaned before the construction of the lining is commenced.

OPENINGS, CHASES AND RECESSES

17. (1) *Lintels and arches over openings*[2].—The portion of a masonry or concrete wall above an opening shall be provided with a lintel or constructed as an arch, and shall comply with the requirements as set out in Chapter 3 or section 18.

(2) *Chases and recesses.*—Where horizontal chases or recesses are cut to a depth greater than one-fifth of the thickness of the wall, or leaf of the cavity-wall, concerned, or are built into the wall to a depth greater than one-third of such thickness, or where chases or recesses are cut or formed on both sides of a particular length of wall, then all such chases or recesses shall be regarded as openings for the purposes of section 40, and shall be bridged over accordingly.

(3) Decorative timber or timber nailing-strips may be set into masonry or concrete walls, piers or columns, but such timber is regarded as a recess if the depth of building in is less than one-third of the thickness of the wall, and as an opening if it is more than one-third.

(4) No length of wall between openings which is less than 230 millimetres in length shall have any opening, recess or chase cut into it unless supported to the approval of the local authority:

Provided that this provision shall not be construed as preventing such an opening, recess or chase being built in as construction proceeds in such a length of wall.

(5) Every chase shall be filled solidly around services with mortar not weaker than class B, and the filling shall be allowed to harden before any plastering is done. The surface of the chase shall be wetted down and the mortar made dry enough to ram into position. The portions of recesses around service-boxes shall be similarly filled with mortar not weaker than class B.

(6) *Wall not to be endangered by openings, chases or recesses.*—The number, size, position and manner of forming of openings, recesses and chases in any masonry or concrete wall, pier or column shall be such that such wall, pier or column is not, in the opinion of the local authority, thereby rendered unsafe.

LINTELS[2]

18. (1) Reinforced concrete lintels may:—

(a) be constructed in accordance with the requirements set out in the Fourth Schedule; or
(b) be proprietary pre-cast lintels of approved manufacture.

(2) Lintels of types other than that specified in subsection (1) may be used subject to the design and construction being approved by the local authority.[3]

CROSS-WALLS

19. Every cross-wall shall comply with the following requirements—

(a) it shall be built at an angle of not less than 40 degrees with the wall which it intersects;

[2] Where required by the provisions of Chapter 11, lintels should have the fire-resistance rating there specified for structural members.

[3] Reinforced brick lintels, if designed and constructed to accord with the provisions of NBR1 Information Sheet X/BOU 2-29, dated June, 1975, issued by the National Building Research Institute of South Africa, shall be deemed to satisfy the requirements of the local authority.

(b) it shall be carried up to the full-storey height of the wall which it supports;

(c) if a gable is to be supported laterally by a cross-wall, the wall may be raked up to the gable in the form of a buttress commencing from the top or wall-plate level of the wall:

Provided that—

(i) the angle of the rake is not greater than 45 degrees to the horizontal; and

(ii) the height of the buttress shall be designed to provide the maximum necessary support to the gable at a point where the cross-wall meets the gable-face; and

(iii) the cross-wall and the buttress shall be bonded to the gable.

(d) its over-all thickness shall be not less than 200 millimetres for solid walls or 280 millimetres for cavity-walls:

Provided that, in a single-storey building or the topmost storey of a building, the over-all thickness may be 100 millimetres for solid walls or 200 millimetres for cavity-walls;

(e) the unbroken length of the cross-wall, adjoining the supported wall, shall be not less than—

(i) for cross-walls less than 200 millimetres in thickness, one-third of the height of the walls; and

(ii) for cross-walls not less than 200 millimetres in thickness, one-quarter of the height of the walls;

(f) the length of cross-walls which are wing-walls or portions of intersecting walls shall be measured from the nearer face of the supported wall, excluding the thickness of the latter;

(g) where a cross-wall is bonded into two return walls, extending in opposite directions from the two ends of the cross-wall, the length of the cross-wall shall include the thickness of the two return walls;

(h) a cross-wall shall be deemed to be properly bonded to a cavity-wall if it is bonded to one leaf only;

(i) a cross-wall which is a cavity-wall shall have both leaves bonded to the wall which it supports;

(j) when a wall and the cross-wall supporting it are built up separately—

(i) the wall and cross-wall shall be bonded together by regular and evenly spaced toothings comprising half the height of the walls, so as to provide a bond of not less than 100 millimetres; or

(ii) metal anchors of minimum cross-section 3 × 32 millimetres or of equivalent cross-sectional area and at least 450 millimetres in length, with ends bent up at least 50 millimetres, shall be provided at vertical intervals not exceeding one metre, and such anchors shall be protected against corrosion.

THRUST FROM ROOF

20. (1) Where a roof exerts lateral thrust on the supporting walls, piers or columns which results wholly or partly from dead load, the walls, piers or columns shall be designed in accordance with the requirements of sections 63 to 82.

(2) If such thrust results from superimposed load only, then no such design shall be necessary on that account.

CORBELLING

21. (1) Walls less than 215 millimetres in thickness shall not be corbelled, nor, in a cavity-wall, shall a leaf less than 215 millimetres in thickness be corbelled:

Provided that nothing in this section shall be construed as preventing walls from overhanging their supports in accordance with the provisions of section 22.

(2) In single-storey dwelling-houses or dwelling-units only, a 215-millimetre solid foundation-wall may be corbelled to support a cavity-wall of a maximum over-all thickness of 300 millimetres:

Provided that—

(i) the total projection does not exceed 50 millimetres on either side;

(ii) the foundation-wall is corbelled out to provide a solid bearing of the full total thickness of the cavity-wall in accordance with section 22;

(3) Except as may be permitted in the requirements for constructions specified in section 22, and as set out in this section, no corbel shall be used to support a wall.

(4) No corbel from a masonry wall less than 330 millimetres in thickness shall be used to support a floor or a roof, except that, in dwelling-houses or dwelling-units only, walls not less than 215 millimetres in thickness may be corbelled to support a timber floor.

(5) Walls built of hollow building-units shall not be corbelled.

(6) In corbels other than those referred to in subsection (2), the maximum horizontal projection shall be 40 millimetres for each 75 millimetres of vertical projection, and the total horizontal projection of the corbelling shall not exceed one-quarter of the required thickness of the wall corbelled, except where it supports a chimney for a dwelling-house or dwelling-unit.

OVERHANGING WALLS

22. Walls may overhang their supports only in the case of a single-storey building or the top storey of a building:

Provided that—

(i) the base of a solid wall or of the leaf of a cavity-wall shall not overhang its support to a total extent greater than one-third of its thickness, whether the overhang occurs on one or on both sides;

(ii) a cavity-wall which is built up as a solid wall, properly bonded, to a height above its base of not less than its total thickness, shall not overhang its support to a total extent greater than one-quarter of its total thickness;

(iii) the support for the overhanging portion of the solidly built-up base of a cavity-wall shall be a corbel, in which each individual course projects beyond the course below by not more than one-third of the height of the course, or, alternatively, shall be a further portion of solid wall, properly bonded, equal in height to the height of a corbel constructed as described in this section.

CORNICES

23. The centre of gravity of every cornice, whether surmounted by masonry or not, shall fall within the middle third of the thickness of the wall below, unless adequate structural support is provided.

ENDS OF BEAMS AND RAFTERS

24. (1) Solid bearing-walls less than 215 millimetres in thickness, and cavity bearing-walls having both leaves not thicker than 100 millimetres each, shall not be broken into, subsequent to being built, for the insertion of beams or rafters, except with the written approval of the local authority.

(2) Timber beams and joists supported upon masonry shall have a bearing at least 75 millimetres in length at each point of support.

(3) Beams and girders, other than those of timber, in empirically constructed buildings shall have an area of bearing on masonry in accordance with the provisions of section 41.

(4) In buildings not empirically constructed, the bearings shall be such as to prevent stresses in the masonry exceeding those specified in sections 63 to 73 or in section 78.

ANCHORAGE TO JOISTED TIMBER AND PRECAST CONCRETE FLOORS

25. (1) Where joisted timber or precast concrete floors are to be regarded as providing lateral restraint to the supporting-wall at the level of the floor, anchors shall be provided to secure the bearers or joists or flooring-units to the wall at distances apart not greater than 1,8 metres, measured along the wall, for a wall extending through two storeys, or not greater than 1,2 metres for a wall extending through more than two storeys.

(2) The anchors referred to in subsection (1) shall—

(a) be of corrosion-resistant metal or protected metal; and

(b) have a cross-section of not less than 3 × 32 millimetres, or equivalent area; and

(c) have a length of not less than 600 millimetres; and

(d) be securely fastened to timber joists by screws, nails or bolts; and

(e) be anchored in the wall by means of split and upset ends, or by other effective means.

(3) Where the restrained wall is parallel to timber joists, such anchors shall be secured to not less than three joists with fastenings which can develop the full strength of the anchor, and herring-bone or solid strutting of cross-section not less than 38 × 38 millimetres shall be provided between the three joists nearest the wall.

(4) The strutting referred to in subsection (3) shall be at right angles to the joists and opposite the wall-anchor.

(5) Where such a wall is parallel to precast flooring-units—

(a) the anchors shall be carried over at least three supporting units or extend at least 750 millimetres from the wall; and

(b) the ends shall be turned down at least 50 millimetres between units or into *in-situ* concrete ribs; and

(c) such anchors shall be protected from corrosion by a dense cement-mortar topping not less than 25 millimetres in thickness.

(6) In the case of cavity-walls, such anchors need to be fixed in the nearer leaf only.

RETAINING-WALLS: GENERAL

26. (1) Every retaining-wall which does not comply with the provisions of section 46 or 56 shall be designed in accordance with the requirements of sections 63 to 82.

(2) A french drain or other efficient form of drain shall be provided behind a wall over 400 millimetres in height, intended to act as a retaining-wall, to drain the fill, and steps shall be taken, where needed, to prevent erosion of the fill near the drain.

(3) Weep-holes to carry off the water from such drain shall be provided through such wall, of size and spacings suitable in the opinion of the local authority, for the soil conditions prevailing.

(4) A surface-drain shall be provided in front of the retaining-wall to dispose of water from the weep-holes.

(5) Notwithstanding the provisions of subsections (2) to (4), the local authority may approve other similarly adequate means to drain the fill behind the retaining-wall, and to dispose of the water so drained off.

PARAPET-WALLS, BALUSTRADE-WALLS[4] AND BREAST-WALLS

27. (1) Masonry parapet-walls shall be designed in accordance with the requirements of sections 63 to 82, unless they are bonded into return walls bonded to the structural frame of the building, or are tied to reinforced-concrete or reinforced-brick columns, or bonded into reinforced-brick piers.

(2) Reinforced-concrete columns shall be constructed in accordance with the provisions of Chapter 3.

[4]Attention is drawn to the requirements for balustrades in Chapters 11 and 12.

(3) Reinforced-brick columns and piers shall comply with the requirements of sections 75 to 82.

(4) The return walls, columns and piers referred to in subsection (1) shall be no farther apart, centre to centre, than—

(a) 7,5 metres for parapet-walls 215 millimetres in thickness; or

(b) 4,5 metres for parapet-walls 100 millimetres in thickness.

(5) If masonry parapet-walls are constructed on a concrete slab, they shall be provided with expansion joints at distances apart not exceeding 7,5 metres, and if such walls are bonded to piers, the expansion joints shall bisect the piers.

(6) Empirically constructed parapet-walls shall be constructed in accordance with section 53, and, if such walls act as balustrades, they shall comply with the requirements of subsection (7).

(7) Masonry balustrade-walls shall be designed in accordance with the provisions of sections 63 to 82, unless tied to columns or bonded into return walls or piers, and shall be provided, where necessary, with expansion joints as required for parapet-walls by subsection (5):

Provided that the return walls, columns or piers shall be not farther apart than—

(a) 6,6 metres for a wall 215 millimetres in thickness; or

(b) 4,05 metres for a wall 100 millimetres in thickness;

and the expansion joints shall be not farther apart than 8,1 metres.

(8) Masonry breast-walls shall be designed and constructed in accordance with sections 63 to 82, as cantilevers from the floor supporting them, and shall be designed to resist all forces, as set out in the standard referred to in Chapter 3, coming directly on to them, in addition to all forces transmitted to them by the windows above them.

VENEERED WALLS

28. (1) Materials used as veneers shall have a thickness not less than stated in S.A.B.S. 073, except where the local authority permits a local diminution of thickness such as that required to permit the support of the veneer on a rib, slab or beam.

(2) Materials used for masonry veneer shall be sound and durable and free from fissures which might affect their durability, and, in the opinion of the local authority, have a record of satisfactory use under conditions comparable to those of their intended use, or be proven durable under test conditions comparable to exposure in the place of their intended use.

(3) No materials other than those referred to in S.A.B.S. 073 shall be used for anchors unless they are tested and shown to be satisfactory, in the opinion of the local authority.

(4) The thickness of the veneer shall not be included in the required thickness of veneered walls. The thickness of the backing and the height of the veneered walls shall be—

(a) for empirically constructed walls, as set out in sections 42 and 43;

(b) for designed walls, as required by sections 63 to 82:

Provided that due allowance shall be made for the additional load caused by the mass of the veneer, and that the effective thickness of the wall is derived from the thickness of the backing alone.

(5) Veneer facings shall be designed and constructed in accordance with the requirements of S.A.B.S. 073, unless calculations of stresses are submitted to, and approved by, the local authority.

(6) Heavy masonry veneer facings shall be tied into a backing of masonry or other non-combustible material[5] which is, in the opinion of the local authority, of adequate stability and rigidity.

(7) Light masonry veneer facings shall be provided with supports at the heads of all openings, except where there omission is specifically approved by the local authority.

(8) The use of veneers shall otherwise comply with the requirements of S.A.B.S. 073.[6]

FACED WALLS

29. (1) For empirically constructed faced walls the building-units and mortar comprising both facing and backing shall comply with the requirements of section 42.

(2) No materials other than those referred to in S.A.B.S. 073 shall be used for anchors unless they are tested and shown to be satisfactory, in the opinion of the local authority.

(3) When the thickness of a faced wall is derived from calculation, the permissible stresses applicable to the building-units and mortar forming the facing or those forming the backing (whichever gives the greater thickness of wall) shall be applied to the whole of the wall.

(4) When the thickness of such wall is taken from the requirements of this Chapter for empirically constructed walls, such thickness shall be that applicable to the building-units and mortar comprising the backing or to those comprising the facing, whichever building-units and mortar require the greater thickness.

(5) The use of facings in faced walls shall otherwise comply with the requirements of S.A.B.S. 073.

MASONRY CURTAIN-WALLS

30. (1) Masonry curtain-walls shall be tied to the horizontal and vertical structural members of the building frame by means of corrosion-resistant anchors, which are secured to such members with fastenings which develop the full strength of the anchor, and there shall be at least one anchor for each 0,8 square metre or remaining portion thereof of

[5]Attention is drawn to the fact that masonry veneer facings which are fixed direct to the structural framework must comply with the requirements for curtain-walls or panel-walls (see definitions).

[6]The sealing-coat and mastic should preferably be from the same manufacturer.

face-area of the curtain-wall, and anchors shall be evenly spaced along such members.

(2) The anchors referred to in subsection (1) shall have the minimum dimensions set out in Table IV.

TABLE IV

ANCHORS FOR CURTAIN-WALLS

1	2	3
Material	Minimum size in millimetres for	
	Wire anchors (diameter)	Strip anchors (thickness × width)
Copper—		
hard-drawn	4,00	—
annealed	5,60	1,60 × 32
Brass, 70% copper, 30% zinc—		
annealed	—	1,60 × 25
half-hard	—	1,20 × 16
Stainless steel	4,00	1,20 × 16
Mild steel, galvanized or otherwise adequately protected	11,20	5 × 20
Malleable cast iron, adequately protected	11,20	5 × 20

(3) Materials not mentioned in Table IV shall not be used for anchors unless they are tested, and the local authority is of the opinion that they are equally satisfactory to those mentioned in Table IV:

Provided that the curtain-wall may be fixed to the frame by some other means acceptable to the local authority.

PANEL-WALLS

31. (1) Panel-walls shall be secured to the structural frame at both ends and, where required by section 52, along their tops, so as to prevent lateral movement, by means of corrosion-resistant anchors, each of a cross-sectional area of not less than 60 square millimetres.

(2) There shall be one anchor for each 0,5 square metre or remaining part thereof of the face area of the panel-wall, and anchors shall be evenly spaced along such edges of the wall as are anchored; alternatively, the wall shall be anchored by another approved method.

(3) Panel-walls which overhang their supports shall comply with the requirements of section 22.

PARTITION-WALLS

32. Every partition-wall shall either be bonded or anchored to cross-walls at both ends as required by section 8 or 19, or shall be so fixed at one end only and at the other be fixed to a framework which, in the opinion of the local authority, provides an adequate lateral support.

CAVITY-WALLS: GENERAL

33. (1) Cavity-walls may be used for load-bearing purposes, subject to the conditions specified in this section.

(2) The inner and outer leaves of the wall shall be separated by a cavity which shall, throughout, be of a width of not less than 50 and not more than 75 millimetres, and, where the damp-proof layer does not bridge the cavity, shall, throughout, extend at least 150 millimetres below damp-proof level, but in no case below finished ground-level.

(3) The inner and outer leaves of the wall shall be securely tied to each other with bonding-ties in accordance with the following paragraphs—

(a) such ties shall be placed at distances apart not exceeding 1 metre horizontally and 450 millimetres vertically;

(b) within 150 millimetres of the sides of every opening, there shall be one tie to every 300 millimetres of height of such opening if the leaves are not connected by a bonded jamb;

(c) the ties shall be butterfly type or vertical twist type, and shall conform to S.A.B.S. 28, Metal ties for cavity walls.

(4) During construction, the cavity shall be cleared regularly of mortar droppings or other debris, and provision shall be made to drain the cavity.

(5) The cavity shall be sealed at the top of the wall, and, if the wall in the storey above overhangs the wall beneath, the lower wall shall be sealed at its top by solid walling of a height of not less than 215 millimetres and of a thickness, measured in the direction of the thickness of the wall, of not less than 215 millimetres.

(6) Where the wall supports a floor on which the superimposed load exceeds 250 kilograms per square metre of floor area, the floor-loads shall be deemed to be carried entirely on one leaf of the wall, which shall be designed and constructed to carry such load.

(7) The external leaf of a load-bearing cavity-wall shall be supported by floor-slabs carried through both leaves of the wall at vertical intervals not greater than 12 metres or three storeys, whichever is the lesser; in such a case, the internal leaf of the wall below such a slab shall be designed to carry the loads coming from both leaves of the wall above such slab.

GENERAL REQUIREMENTS FOR HOLLOW MASONRY UNITS

34. Where hollow masonry building-units are used in masonry construction, the following requirements shall be complied with—

(a) where roofs, floors or beams bear directly on walls, piers or columns, either—

(i) all cavities in the top course of building-units in the supporting member shall be completely filled with mortar of the same class as that used for laying the units; or

(ii) the top course in the supporting member shall be of solid building units not less than 100 millimetres in height;

(b) where a wall of hollow units is decreased in thickness at any particular height, the top course of units of the thicker section shall either be completely filled with mortar of the same class as that used in laying the units or

be of solid units not less than 100 millimetres in height;

(c) in no case shall a foundation-wall of hollow units be corbelled to carry a thicker wall;

(d) in no case shall a wall of hollow units support a veneer, except in accordance with S.A.B.S. 073;

(e) where mortar is spread on the cross-webs, a clear space, free of mortar, not less than 25 millimetres in width, may be left at the centre of each such web to prevent the passage of moisture through the joint.

GENERAL REQUIREMENTS FOR SOIL-CEMENT UNITS

35. (1) Soil-cement building-units shall not be used in masonry in the following cases—

(a) in basement-walls or foundation-walls;

(b) in lintels and arches;

(c) in walls exposed, in the opinion of the local authority, to prolonged rainfall or continual dampness;

(d) in veneered walls.

(2) Soil-cement blocks and soil-cement bricks may be used in bearing-walls other than those set out in subsection (1) if such walls are designed in accordance with the provisions of sections 63 to 82.

(3) In walls not designed in accordance with the provisions of sections 63 to 82—

(a) soil-cement blocks may be used only in single-storey and double-storey buildings; and

(b) soil-cement bricks may be used only in single-storey buildings.

(4) Two-storey buildings built of soil-cement blocks shall be strengthened by a concrete-belt course which is—

(a) not less than 150 millimetres in depth, and of the full width and length of the walls; and

(b) reinforced with two 10-millimetre-diameter mild-steel rods, or reinforcement of equivalent cross-sectional area; and

(c) of Grade 20; and

(d) situated immediately under the upper-floor joists;

and which shall extend continuously around the building.

(5) Conduits and pipes, other than water-pipes, plumbing and drain-pipes, may be housed in chases in soil-cement walls:

Provided that, if such conduits or pipes are of an external diameter greater than 25 millimetres, such chases shall not be cut, but shall be built in as the work proceeds, and the wall shall be thickened around the chase to the extent of the dimensions of the chase.

GENERAL REQUIREMENTS FOR GYPSUM BLOCKS

36. (1) Gypsum blocks shall be used only in non-load-bearing, interior walls which are not, in the opinion of the local authority, exposed to continual dampness.

(2) Gypsum blocks shall not be laid in any mortar other than gypsum mortar, and shall not be allowed to come into contact with Portland cement and Portland cement products within seven days after the cement was mixed with water.

GENERAL REQUIREMENTS FOR HOLLOW GLASS BLOCKS

37. (1) Hollow glass blocks used in masonry walls shall be regarded as forming non-load-bearing panels in such walls, which, for the purposes of section 17, shall be regarded as openings, and shall comply with the requirements of the following subsections.

(2) If the panel of hollow glass blocks exceeds six metres in height or breadth, or 12 square metres in area, then intermediate stiffeners, in accordance with the requirements of subsections (11) and (12), shall be provided so as to limit the area of blocks between the supports afforded by such stiffeners or by the edges of the panel to not more than 12 square metres.

(3) The distance apart of such parallel supports shall not exceed six metres.

(4) In exterior walls, the panels shall be accommodated in masonry or other recesses, and, in interior walls, in recesses or rebates at the head and jambs of the opening, and, on these three sides, clearance joints not less than 12 millimetres in width shall be provided in order to keep the panel free of the surrounding wall.

(5) The clearance joints shall be filled with a non-hardening compound or with glass fibre pointed with a non-hardening compound.

(6) Horizontal reinforcement for the panel shall be provided in the form of corrosion-resistant metal strips or mesh not less than 25 millimetres and not more than 65 millimetres in width, which shall be built into the horizontal mortar joints as follows—

(a) for panels not longer than 4,5 metres, every fifth course;

(b) for panels not longer than 5,1 metres, every fourth course;

(c) for panels not longer than 6 metres, every third course;

but the vertical interval between reinforcements shall not exceed 1 metre.

(7) Where of steel, reinforcing strips shall be not less than 1 millimetre, and steel reinforcing mesh shall consist of not less than two longitudinal wires, each not less than 3,55 millimetres, with cross-wires not less than 2 millimetres, welded to the longitudinal wires at intervals not exceeding 200 millimetres.

(8) Where other shapes or metals are used, the tensile strength shall be not less than that of such steel reinforcement.

(9) Where the reinforcing-strips are of steel-wire mesh, they shall continue throughout the length of the horizontal mortar joints, and be turned up in the expansion joints not less than 75 millimetres, and be

secured to the frame of the building or to a stiffener by means of nails, bolts or wire located at least 40 millimetres above the horizontal joint.

(10) The fastening shall be capable of developing the full strength of such reinforcing-strip.

(11) *Stiffeners.*—Stiffeners shall be of sufficient strength to withstand the bending moments and shearing forces which may be caused by dead loads and wind forces on the glass-block panel at stresses not exceeding 20 *per centum* of the minimum specified tensile strength of the materials concerned.

(12) Stiffeners of steel shall be protected against corrosion by painting or by some other method of an efficiency satisfactory to the local authority.

(13) *Mortar for glass blocks.*—Mortar used with glass blocks shall be mixed in the proportions of 1 part of cement to 1 part of hydrated lime or lime-putty, to not less than 4 and not more than 6 parts of sand by volume.

GENERAL REQUIREMENTS FOR NO-FINES CONCRETE

38. (1) The use of no-fines concrete for walling shall be subject to the requirements of the following subsections.

(2) No-fines concrete shall be used only in the bearing-walls of buildings not exceeding two storeys in height, in which the superimposed loads on suspended floors do not exceed 250 kilograms per square metre, or of dwelling-houses of not more than three storeys, and in panel-walls, partition-walls and wing-walls.

(3) No-fines concrete shall not be used in any foundation-wall or basement-wall, and no-fines concrete walls shall not be veneered except in accordance with S.A.B.S. 073.

(4) Holes, chases and recesses shall all be formed during construction of the wall, and shall not be cut afterwards.

(5) All exterior surfaces shall be rendered with rendering at least 12 millimetres thick, which shall be mixed in the proportions specified for class B or class C mortar in subsection (7) of section 13, and weep-holes at least 10 millimetres in diameter shall be formed in such rendering just above the damp-proof course and not farther apart than 1,5 metres:

Provided that the wall may be rendered waterproof, and provision may be made for draining in any other manner approved by the local authority as being similarly adequate.

(6) The bearing-surfaces which are to support timber or steel joists or precast concrete beams or slabs shall be levelled off to a smooth surface with class A mortar of a thickness of not less than 20 millimetres at the thinnest point, and the joists, beams or slabs shall bear solidly on such mortar surface at all points of the bearing-area.

(7) All reinforcement-rods used in the walls shall first be derusted and all loose mill-scale removed, and then be protected against corrosion by a coating of cement slurry which shall be allowed to harden before the concrete is cast around the rods.

(8) There shall be no raking construction joints in the walls.

(9) The concrete shall be mixed and placed as specified in Chapter 3:

Provided that the concrete shall not be vibrated, but shall be rodded sufficiently to place it in its correct position.

(10) Flues in no-fines concrete walling shall be surrounded by normal, plain concrete not less than 25 millimetres in thickness, and no-fines concrete not less than 150 millimetres in thickness shall be placed around the normal concrete.

PART II

GENERAL REQUIREMENTS FOR EMPIRICAL MASONRY CONSTRUCTION[7]

FLOORS, ROOFS, CHASES, RECESSES AND PANEL-WALLS IN EMPIRICAL CONSTRUCTION

39. (1) The provisions of this section shall apply in empirically constructed buildings of masonry.

(2) Suspended floors other than of timber, or structural units comprising such floors, shall not exceed in span the figure set out in column 3 of Table V for the superimposed load per square metre for which the floor is designed set out in column 2 of Table V, and the superimposed load on suspended floors in such buildings shall not exceed 250 kilograms per square metre.

TABLE V

MAXIMUM WIDTH OF SUSPENDED FLOOR SLABS FOR EMPIRICAL CONSTRUCTION

1	2	3
Class of loading	Minimum superimposed load on floor, kilograms per square metre	Maximum span of floor or floor units, metres
140	140	6,0
190	190	5,1
240	240	4,2

(3) The span of roof-trusses or girders shall not exceed 12 metres, and, where such span exceeds 10,5 metres, the mass of the roof-covering, together with the purlins and framing, shall not exceed 35 kilograms per square metre of horizontal area.

(4) Roofs shall be so constructed that no horizontal or inclined force other than that due to wind force is transmitted to walls.

(5) No recess shall be cut or formed so as to occupy a horizontal length of wall between the two vertical lines drawn through the adjacent sides of any

[7]Attention is drawn to the fact that the walls designed in accordance with sections 63 to 82 do not also have to comply with the requirements for empirically constructed walls including Tables V to XVI.

two adjacent openings greater than one-quarter of the horizontal distance between such lines.

(6) No opening, and no chase or recess regarded as an opening in terms of subsection (2) of section 17, shall be made in any panel-wall unless such panel-wall is fixed along its top in accordance with the requirements of section 52.

WALL-SECTIONS BETWEEN OPENINGS IN EMPIRICALLY CONSTRUCTED WALLS

40. (1) The number, size or position of openings in a wall, including chases or recesses regarded as openings in terms of subsection (2) or (3) of section 17, shall not be such as to impair the stability of the wall or any part of it.

(2) The distance between any part of an opening made in an external wall, and the outer face of a return external wall, shall not be less than one-and-a-half times the thickness of the wall in which the opening is made, unless adequate support at the corner is provided by other means.

(3) Adequate means of supporting the superstructure shall be provided over every opening in any wall.

BEARINGS FOR BEAMS OTHER THAN TIMBER IN EMPIRICAL CONSTRUCTION

41. (1) Beams and girders, other than lintels referred to in subsection (3), which support only a floor carrying a superimposed load not exceeding 250 kilograms per square metre, and which rest on empirically constructed walls or piers, shall have a bearing-area at each end of each opening bridged by such a beam or girder of not less than the following—

(a) where the beam rests on brickwork, squared stonework or normal concrete: 35 SB square centimetres;

(b) where the beam rests on block masonry, random rubble stonework or no-fines concrete: 70 SB square centimetres;

where

S = clear span of beam or girder between supports, in metres; and

B = average distance, in metres from the beam or girder to the adjacent parallel beams, girders or walls supporting the floor.

(2) Alternatively to the provisions of subsection (1), the ends of the beams or girders there mentioned shall rest on bearing-plates or padstones which themselves rest on a bearing-area at least equal to the values given in this subsection.

(3) Lintels in empirically constructed walls not supporting any cantilevered construction shall bear at their ends on the full thickness of such wall, or on bearing-plates or padstones of a width equal to such thickness.

(4) The length of bearing at each end shall be not less than one-tenth of the clear span of the lintel with a minimum bearing length of 115 millimetres.

(5) The bearing-area for beams, girders and lintels other than those mentioned in this section shall be designed in accordance with the relevant requirements of sections 63 to 82.

MINIMUM REQUIREMENTS FOR MATERIALS FOR EMPIRICAL CONSTRUCTION

42. (1) Except where otherwise specifically permitted in this Chapter, the compressive strength of building-units and the class of mortar used in the erection of empirically constructed masonry walls which are not heavily veneered shall be not inferior to that shown in Table VI and VII for the type of wall and construction, and for the storey or total height of wall concerned.

(2) No interpolation in strength of unit may be made for intermediate total heights of wall in Table VII.

(3) For the purposes of this section only, where a foundation-wall has a height at any point which exceeds 1,5 metres, measured from the top of the foundation-footing or other support to the underside of the ground floor, then such wall shall be regarded as being in an additional storey below the ground storey.

(4) If the height measured in terms of subsection (3) is less than 1,5 metres at all points, the foundation-wall shall not be regarded as being in a separate storey, and the materials in it shall be as required for walls in the ground storey.

TABLE VI

MINIMUM REQUIREMENTS FOR MATERIALS OTHER THAN SOIL-CEMENT* USED IN EMPIRICALLY CONSTRUCTED MASONRY BEARING-WALLS

1	2	3	4	5
Storey	Type of construction	Minimum compressive strength† of units, megapascals, for		Weakest class of mortar
		Brick size	Block size	
Single storey or topmost storey	Light-mass	7,0	2,8‡	C§
	Not light-mass	7,0	3,4‡	C§
		10,5	—	D (or C)‖
First storey below topmost storey	Light-mass	8,4	—	B
		—	2,8	C
	Not light-mass	10,5	3,4	C
Second storey below topmost storey	Light-mass	10,5	4,9	B
	Not light-mass	17,5	7,0	B
Third storey below topmost storey	All kinds	28,0	Not permitted	B

* In the case of soil-cement bricks and blocks, the strength thereof when tested in accordance with the standard specification for clay bricks or concrete blocks respectively, as set out in section 5, shall be not less than 2,8 megapascals, and class C or B mortar shall be used in a single-storey building or the topmost storey, while class B mortar shall be used in a block wall in a storey of a building below the topmost storey.

† Calculated on gross area of units.

‡ For block walls when walls are less than 200 millimetres in thickness, 4,9 megapascals (see section 57).

§ For block walls less than 200 millimetres thick, class B.

‖ When walls are not in accordance with Table X, class C or better.

(5) The compressive strength of building-units and the class of mortar used in empirically constructed masonry walls carrying heavy veneer shall not be inferior to that shown in Table VIII.

(6) No interpolation in strength of unit may be made for intermediate total heights of wall.

(7) The mass of the veneer carried on empirically constructed masonry walls shall not exceed 170 kilograms per square metre, inclusive of backing-mortar, and class D mortar shall not be used.

(8) Such walls may be built of the same minimum grades of materials as those set out in Tables VI and VII if their thickness is made at least 100 millimetres greater than that given in Table VIII for the maximum total height of wall and material concerned.

(9) The requirements for the materials and the dimensions of empirically constructed masonry walls carrying light veneer shall be the same as those for masonry walls without veneer.

(10) The cube strength at 28 days of concrete used in empirically constructed walls and piers shall be not less than as follows—

(a) for normal concrete and light-mass normal concrete, it shall be as specified in section 14;

(b) for no-fines concrete, it shall be as specified in section 14, except that, in the following cases, it shall be—

(i) in all walls less than 200 millimetres in thickness, 2,45 megapascals;

(ii) in walls of dwelling-houses in the second storey below the topmost storey, 2,8 megapascals.

(11) Where, under this section, building-units of different strengths are to be used in the different storeys of a building—

(a) the units of each different strength shall be clearly distinguished from those of any other strength, either by means of colour or surface texture, and shall be delivered and kept separate from them; and

(b) the same combination of unit strength and mortar class shall be used throughout in the bearing-walls and piers in any one storey, and this combination shall be stated on the building plans referred to in Chapter 2; and

(c) the person erecting the building shall at all times keep available and ready for use not less than three nominal 100-millimetre cube-moulds as described in B.S. 1881, Methods of testing concrete.

(12) If the average strength of any three cubes of mortar cast in terms of paragraph (c) of subsection (11), when tested in accordance with the provisions of Chapter 2, is less than the minimum specified in subsection (7) of section 13 for the class of mortar which is marked on the plans for the work concerned, then the masonry in which the mortar, which is represented by those three cubes, was used shall be deemed not to comply with the requirements of these by-laws.

(13) Where neither the height nor the length of an empirically constructed panel-wall exceeds 90 *per centum* of the maximum value permitted in section 52 or 57, as the case may be, mortar not weaker than class C may be used in such walls, and, where neither of such dimensions exceeds 75 *per centum* of such values, class D mortar may be used.

TABLE VII
MINIMUM REQUIREMENTS FOR MATERIALS USED IN EMPIRICALLY CONSTRUCTED NON-BEARING WALLS

1	2	3	4	5
Maximum total height of wall, metres	Type of construction	Minimum compressive strength* of units, megapascals, for		Weakest class of mortar
		Brick size	Block size	
A. CURTAIN-WALLS				
7,2	All kinds	7,0	2,8	D
12,3	Light-mass	7,0	2,8	D
	Not light-mass	10,5	3,4	C
18,3	All kinds	21,0	7,0	C
B. PARTITION-WALLS				
—†	All kinds	7,0	2,8	D
C. PANEL-WALLS				
—†	All kinds	10,5	2,8	B[a]
D. FREE-STANDING WALLS				
—†	Not light-mass[b]	10,5	3,4	B
E. RETAINING-WALLS				
—†	Not light-mass[b]	14,0	7,0	A

* Measured on gross area.
† See sections 52 and 54 to 56 for permissible heights.

DIMENSIONS OF EMPIRICALLY CONSTRUCTED WALLS CARRYING HEAVY VENEER

43. (1) Empirically constructed masonry walls, or leaves of cavity-walls, carrying heavy veneer shall comply with the requirements set out in subsections (2) to (6) and in Table IX for the types of walls mentioned in that Table.

(2) In no case shall the thickness be less than the least value given for the relevant type of wall and the storey-height, and for blocks not less than 200 millimetres.

(3) The storey-height shall not exceed the value given for the relevant type of wall and the minimum thickness.

(4) Panel-walls shall be fixed along their tops as specified in section 31.

(5) Partition-walls shall be similarly fixed along their tops or be fixed by wedging under the structural member above with hard, durable materials and filling in solid around the wedges with mortar.

(6) The total height shall not exceed the maximum figure shown for the relevant type of wall, regardless of its thickness.

[a] See section 42 (13).
[b] See section 57 (5).

TABLE VIII

MINIMUM REQUIREMENTS FOR MATERIALS USED IN EMPIRICALLY CONSTRUCTED MASONRY WALLS CARRYING HEAVY VENEER[10]

1	2	3	4	5	6
Maximum total height, measured from top of wall, metres	Minimum permissible thickness of wall in lowest storey, millimetres	Type of construction	Minimum compressive strength of units, megapascals,* for		Class of mortar for units specified
			Brick-size	Block-size	
A. BEARING-WALLS					
7,2	215†	All kinds	14,0	10,5	B
10,8	330	All kinds	28,0	14,0	B
B. CURTAIN-WALLS					
7,2	215†	Light-mass	7,0	4,9	B
		Not light-mass	10,5	7,0	B
10,8	215†	Light-mass	10,5	7,0	B
		Not light-mass	21,0	14,0	B
C. PARTITION-WALLS AND PANEL-WALLS, FIXED AT THE TOP					
2,7	100	Solid	7,0	Blocks not permitted	C
2,7	100‡	Cavity	7,0		
3,6	100‡	Cavity	21,0		
3,6	215†	Solid	10,5	4,9	C

* Measured on gross area.
† For blocks, may be 200.
‡ Indicates thickness of each leaf.

TABLE IX

LIMITING DIMENSIONS OF EMPIRICALLY CONSTRUCTED WALLS CARRYING HEAVY VENEER

1		2	3	4
Type of wall		Minimum thickness, millimetres	Maximum storey-height, metres	Maximum total height of wall, metres
Bearing-walls and curtain-walls		215*	3,6	10,8
Panel-walls and partition-walls	Solid	100	2,7	2,7
	Cavity†	100	3,6	3,6
	Solid	215*	3,6	3,6

* For concrete and blocks, may be 200.
† Thickness of each leaf.

[10] See section 43 for minimum dimensions of walls carrying heavy veneer.

PART III

REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY[11] AND CONCRETE

A. BRICK BEARING-WALLS

PERMISSIBLE "STOREY" DIMENSIONS FOR EMPIRICALLY CONSTRUCTED BRICK BEARING-WALLS

44. (1) For empirically constructed brick bearing-walls, the storey-height and unsupported length of wall in any storey shall fall within the limits specified in Table X or XI for the class of mortar used, effective thickness of wall and the storey concerned.

(2) The actual thickness of walls shall be not less than the minimum effective thickness shown for the storey concerned.

PERMISSIBLE TOTAL HEIGHT FOR EMPIRICALLY CONSTRUCTED SOLID-BRICK BEARING-WALLS

45. (1) For empirically constructed solid-brick bearing-walls, the total height of the wall, including

[11] Masonry of brickwork includes construction of both clay and cement bricks and mortar.

the height of the foundation-wall, shall not exceed the following, when laid in class A, B or C mortar—

(a) for single-storey buildings, 5,4 metres;

(b) for two-storey buildings, 9 metres;

(c) for three-storey buildings, 12 metres;

(d) for four-storey buildings, 15 metres.

(2) When such walls are laid in class D mortar, such maximum height shall not exceed 5,4 metres.

(3) In buildings which have more than four storeys, or walls higher than 15 metres, the walls shall be designed in accordance with the requirements of sections 63 to 82.

TABLE X

PERMISSIBLE DIMENSIONS FOR EMPIRICALLY CONSTRUCTED BRICK BEARING-WALLS LAID IN CLASS D MORTAR*

1	2	3	4	5	6
		Maximum storey-height, in metres, for			
		External walls		Internal walls	
Minimum effective thickness, millimetres	Maximum unsupported length, metres	Moderately restrained at the top of the storey†	Fully restrained at the top of the storey†	Moderately restrained at the top of the storey†	Fully restrained at the top of the storey†
215	6,6	Not permitted	2,7	3,0	3,6
215	5,4	3,0	3,6	3,3	4,2
330	7,2	4,2	5,4	4,5	5,4

* Class D mortar may be used in bearing-walls only in single-storey buildings or the topmost storey of a building.

† See definitions of "restrained", "a wall fully restrained at the top" and "a wall moderately restrained at the top".

Joisted timber floors and precast concrete floors not anchored in accordance with section 25 shall be regarded as giving no lateral restraint to the walls supporting them.

EMPIRICALLY CONSTRUCTED BRICK FOUNDATION-WALLS AND BASEMENT-WALLS

46. (1) Empirically constructed brick foundation-walls, sleeper-walls or basement-walls shall comply with the requirements of the following subsections.

(2) The effective thickness of such walls shall be not less than 215 millimetres, measured exclusive of skin-walls which protect damp-proof treatment.

(3) Fill placed between such walls shall not be placed before the periods set out in section 9 have elapsed after completion of such walls, and such fill shall, in the opinion of the local authority, be sufficiently dry at the time of placing, and sufficiently well drained.

(4) The full height of the fill referred to in subsection (3), measured above the adjoining finished ground-level, shall not exceed the following—

(a) for a wall 215 millimetres in thickness, 1,8 metres;

(b) for a wall 280 millimetres in thickness, solid, 2,1 metres;

(c) for a wall 330 millimetres in thickness, 2,7 metres:

Provided that the height of such fill shall not exceed one metre except where the fill is of hardcore or the floor is designed and constructed as a suspended floor and carried through the thickness of the supporting walls.

(5) The full height of exterior back-filling, measured above the level of a solid floor or above the ground-surface under a suspended floor, placed against any such wall shall not exceed the values given in subsection (4) for fill, and the following requirements shall be complied with—

(a) there shall be no surcharge above the point at which the surface of the back-filling meets such wall;

(b) the back-filling shall be drained to the satisfaction of the local authority;

(c) the thickness of any skin-wall which protects vertical damp-proof or waterproof layers shall not be included in the thickness of any foundation-wall or basement-wall when the permissible height of back-filling is determined.

EMPIRICALLY CONSTRUCTED BRICK BEARING-WALLS 100 MILLIMETRES IN THICKNESS

47. (1) Empirically constructed brick bearing-walls shall have a thickness of not less than 100 millimetres, and shall be constructed to comply with the requirements of the following subsections.

(2) External walls of a thickness of 100 millimetres shall be permitted to be constructed for use in any veranda, loggia, garage to a dwelling-house, greenhouse, servant's quarters to a dwelling-house, tool-shed, potting-shed, cycle-shed, aviary, poultry-house or summer-house, or a dwelling-house in an area designated by the local authority:

Provided that—

(a) every such wall shall not exceed 2,5 metres in total height;

(b) in the case of multi-storey buildings, the length of every such wall shall not exceed 3,4 metres, unless it is divided into panels of no greater length than 3,4 metres by a pier or piers, 215 millimetres square in total horizontal cross-section, bonded into it, in which case the total length of every such wall may be 10,63 metres;

(c) in the case of single-storey buildings, the length of every such wall shall not exceed 4 metres, unless it is divided into panels of no greater length than 4 metres by a pier or piers, 215 millimetres square in total horizontal cross-section, bonded into it, in which case the total length of every such wall may be 8 metres;

(d) except in the case of a veranda or loggia—

(i) the building shall be wholly detached from any other building; and

(ii) the building shall be of approved design; and

TABLE XI

PERMISSIBLE DIMENSIONS FOR EMPIRICALLY CONSTRUCTED BRICK BEARING-WALLS[12] LAID IN MORTAR OF CLASS A, B OR C

1	2	3	4	5	6	7	8
Storey	Effective thickness, millimetres, not less than	Maximum unsupported length, metres	Maximum storey-height, metres, for: External walls which, at the top of the storey, are — Moderately restrained*	External walls which, at the top of the storey, are — Fully restrained*	Internal walls which, at the top of the storey, are — Unrestrained	Internal walls which, at the top of the storey, are — Moderately restrained*	Internal walls which, at the top of the storey, are — Fully restrained*
A. SOLID WALLS							
Single storey or a topmost storey	100	5,4	Only in accordance with section 47		Not permitted	2,7	3,0
		6,0				3,3	3,6
	215	9,0	3,3	4,2	3,0	4,8	5,4
		6,0	4,2	4,8			
	330	12,3	4,2	5,4	4,2	5,4	5,4
		9,0	4,8	5,4			
		6,0	5,4	5,4			
	440	15,3	5,4	5,4	4,5	5,4	5,4
First storey below topmost storey	100	5,4	Not permitted	Not permitted	Not permitted	Not permitted	3,0
		6,0					3,6
	215	9,0	3,3	4,2	Not permitted	4,8	5,4
		6,0	4,2	4,8			
	330	9,0	5,4	5,4	3,6	5,4	5,4
Second storey below topmost storey	215	9,0	Not permitted	Not permitted	Not permitted	4,8	5,4
	330	9,0	4,5	5,4	3,6	5,4	5,4
	440	9,0	5,4	5,4	4,8	5,4	5,4
Third storey below topmost storey	330	9,0	Not permitted	Not permitted	3,0	5,4	5,4
	440	9,0	5,4	5,4	4,2	5,4	5,4
B. CAVITY-WALLS							
Single storey only	180 (65—50 cavity—65) wall, bonded by header bricks 215 (65—50 cavity—100) or 195 (65—65 cavity—65) wall, bonded by header bricks	3,6	2,7	2,7	Not permitted	2,7	2,7
		3,6	3,0	3,0		3,0	3,0
Topmost storey and first storey below topmost storey	280 (actual thickness) (100—75 cavity—100)	9,0	3,0	3,3	2,7	3,3	3,6
		6,0	3,3	3,6	2,7	3,6	4,2
		4,2	3,6	4,2	3,0	4,2	4,8

* See definitions of "restrained", "a wall fully restrained at the top" and "a wall moderately restrained at the top".
Joisted timber floors and precast concrete floors not anchored in accordance with section 25 shall be regarded as giving no lateral restraint to the walls supporting them.

[12] For the full list of limitations applicable to empirical construction, which govern the use of the dimensions in this Table, see sections 39 to 43. IT IS EMPHASIZED THAT WALLS LONGER THAN AS SHOWN IN THE TABLE, AND WALLS IN STOREYS FOR WHICH DETAILS ARE NOT GIVEN IN TABLE XI, MUST BE DESIGNED IN ACCORDANCE WITH SECTIONS 63 TO 82.

(iii) the volume of the building shall not exceed 60 cubic metres except a dwelling-house in an area designated by the local authority;

(e) the roof resting on such walls shall be so constructed that no load other than the mass of the roof and the wind force on it shall be transmitted by the roof to the wall;

(f) the highest point of the roof resting on such walls shall be not more than 1,5 metres above the top of any of them;

(g) except in the case of walls constructed of brick of a compressive strength of not less than 15 megapascals and water absorption not exceeding 12 *per centum* laid in class B mortar, as defined in subsection (3) of section 13, every such wall of every habitable room shall be plastered externally with plaster complying with the requirements of class D mortar in section 13 to a thickness of not less than 10 millimetres.

(3) External walls of 100 millimetres in thickness shall be permitted to be constructed for use in a structure above the general level of a flat roof of a building, and need not be subject to the limitations set out in subsection (2) if—

(a) such structure is not used or adapted to be used as a habitable room or as a workroom or office; and

(b) the height of the walls does not exceed 2,4 metres, measured to their top from the level of the flat roof adjacent; and

(c) the length of the walls does not exceed 3 metres.

(4) Internal walls of 100 millimetres effective thickness shall be constructed in accordance with Table XI, and shall—

(a) be of brick with a compressive strength of not less than 7 megapascals or such other strength as the local authority shall determine; and

(b) be laid in class B mortar; and

(c) not be used in storeys other than the topmost two storeys of a building; and

(d) in a single-storey building or the topmost storey of a building, be at least moderately restrained at the top.

EMPIRICALLY CONSTRUCTED BRICK WALLS ABOVE THE ROOF

48. (1) Empirically constructed external brick bearing-walls, when used to enclose stairways or habitable or working-space above the general roof-level shall be not less than 215 millimetres in thickness.

(2) If the walls referred to in subsection (1) are not higher than 3,6 metres, and the area enclosed between them does not exceed 10 *per centum* of the area of the roof, they may be constructed as though they did not add to the number of storeys of the building:

Provided that the local authority may, in its discretion, require the thickness of the walls in the storeys immediately under such first-mentioned walls, or under structural members supporting them, to be determined as though the walls above the general roof-level constituted an additional storey.

EMPIRICALLY CONSTRUCTED BRICK CAVITY-WALLS

49. (1) Empirically constructed brick cavity bearing-walls shall comply with the requirements of this section.

(2) In single-storey dwelling-houses only, such walls shall have leaves not less than 65 millimetres in thickness, and their dimensions shall comply with Table XI.

(3) Such gable-walls with leaves 65 millimetres in thickness shall have a height to the top of the gable not exceeding the following—

(a) for a wall bonded with header bricks at every alternate course, 4,8 metres;

(b) for a wall bonded otherwise than as described in paragraph (a), 3,6 metres.

(4) If such cavity-walls with leaves 65 millimetres in thickness are bonded into a pier or piers of a total solid cross-sectional area not less than 440 by 330 millimetres, not farther apart than 3,6 metres, centre to centre, their total length may exceed 3,6 metres but shall not exceed 7,2 metres.

(5) In all two-storey buildings, the leaves of such walls shall be not less than 100 millimetres in thickness, and shall comply with the dimensions set forth in Table XI.

(6) Such walls having leaves 100 millimetres in thickness shall not exceed two storeys in height, and the height to the top of the gable of any such gable-wall, measured from the floor of the gabled storey, shall not exceed 4,8 metres.

(7) In every such wall with leaves not thicker than 100 millimetres, the construction shall be such that the load on such wall is transmitted to both leaves.

(8) The storey-height of such walls with one or both leaves more than 100 millimetres in thickness shall not exceed that permitted for a solid wall of the same thickness as the thicker leaf, or for a solid wall of the same thickness as each leaf if the leaves are of the same thickness.

EMPIRICALLY CONSTRUCTED BRICK COLUMNS

50. (1) Columns which are sleeper-piers may be built without design if they are not less than 215 by 215 millimetres in cross-section and not higher than eight times their least lateral dimension, and are bedded on a foundation complying with the provisions of Chapter 4.

(2) All other columns shall be designed in accordance with sections 63 to 82, unless otherwise permitted by the local authority.

EMPIRICALLY CONSTRUCTED BRICK WING-WALLS

51. (1) Empirically constructed brick wing-walls shall be at least moderately restrained along their

tops, and shall be not less than 100 millimetres in thickness, and shall not continue through more than two storeys.

(2) The storey-height and the length of such walls shall not exceed the following—

Minimum thickness, millimetres	*Maximum storey-height, metres*	*Maximum length, metres*
100	2,7	1,8
215	3,6	3,6

B. BRICK NON-BEARING WALLS

EMPIRICALLY CONSTRUCTED BRICK CURTAIN-WALLS AND PANEL-WALLS

52. (1) Empirically constructed brick curtain-walls shall—

(a) have a thickness which is—
  (i) not less than 215 millimetres; and
  (ii) uniform throughout the height of the wall in any one storey;
and

(b) not exceed a height of—
  (i) 5,4 metres in any one storey; or
  (ii) a total of 18,3 metres when laid in class A, B or C mortar; or
  (iii) a total of 7,2 metres when laid in class D mortar.

(2) Empirically constructed solid brick or cavity brick panel-walls shall have an effective thickness of not less than 100 millimetres.

(3) The effective thickness of faced panel-walls shall include brickwork and facing, but that of veneered panel-walls shall exclude the veneer.

(4) Walls constructed as panel-walls shall sustain no forces other than their own mass and wind forces, unless such other forces are approved by the local authority.

(5) Panel-walls which contain openings shall be fixed along their tops in the manner specified in section 31, and the curves designated in Figure 1 as "top fixed" refer to panel-walls so fixed.

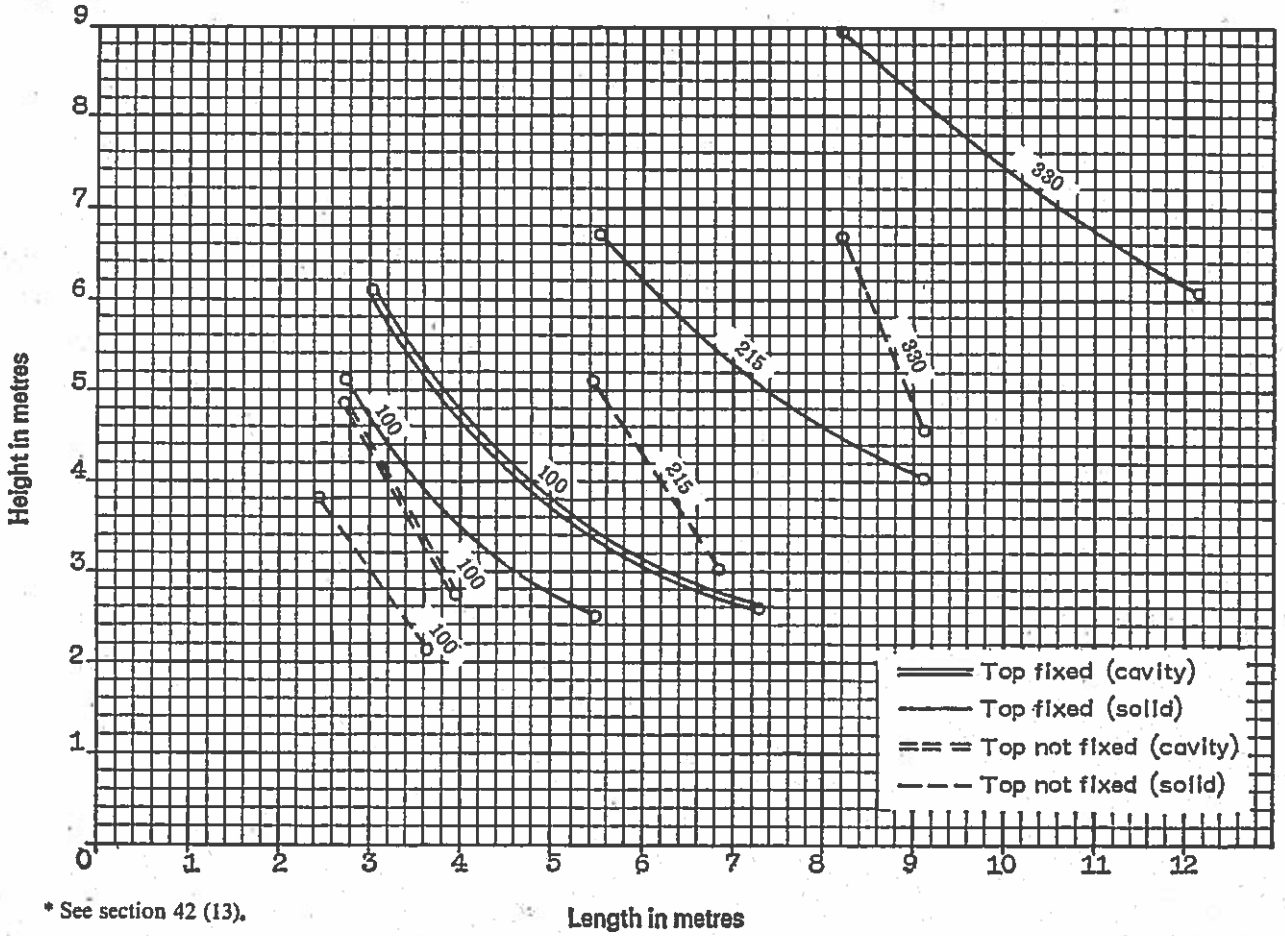
(6) The length and height of any panel-wall shall not exceed the values corresponding to any point on the appropriate curve in Figure 1 for the relevant condition of the top of the panel-wall and its thickness.

EMPIRICALLY CONSTRUCTED BRICK PARAPET-WALLS AND BALUSTRADE-WALLS

53. (1) Empirically constructed brick parapet-walls shall have a thickness of not less than one-sixth of their

FIGURE 1

DIMENSIONS OF EMPIRICALLY CONSTRUCTED BRICK PANEL-WALLS (CLASS B MORTAR*)



* See section 42 (13).

height or 215 millimetres, whichever is the greater, and shall be laid in class A mortar.

(2) They shall be reinforced in the highest four bed-joints with reinforcement consisting of two strands of steel wire of a diameter of not less than 3,55 millimetres, or two steel strips of equivalent cross-sectional area per bed-joint, and such reinforcement shall be lapped over a distance of at least 150 millimetres with the anchors to the supporting-columns required by section 27.

(3) Empirically constructed brick balustrade-walls shall be not less than 100 millimetres in thickness, and shall be laid in class A mortar and reinforced as required by subsection (2).

DIMENSIONS OF EMPIRICALLY CONSTRUCTED BRICK PARTITION-WALLS

54. The maximum height of empirically constructed brick partition-walls shall be as set out in Table XII for the thickness, and unsupported length also set out in that Table.

TABLE XII

DIMENSIONS OF EMPIRICALLY CONSTRUCTED BRICK PARTITION-WALLS

1	2	3
Thickness, millimetres*	Maximum height, metres	Maximum unsupported length, metres
65	3,0	4,5
100	3,3	9,0
150	4,2	9,0
200	4,8	9,0
215	6,0	9,0

* Thinner partition-walls may be constructed, subject to the approval of the local authority.

DIMENSIONS OF EMPIRICALLY CONSTRUCTED BRICK FREE-STANDING WALLS

55. (1) Free-standing brick walls of the minimum thicknesses shown in Table XIII shall not be constructed empirically to greater heights above the adjoining finished ground-level than are set forth in that Table.

(2) Where details of piers are given in Table XIII, every such wall shall be bonded into piers which, together with the thickness of such wall, shall comply with the minimum dimensions set forth in that Table and are spaced in accordance with the maximum dimensions laid down in that Table.

(3) The foundation of every such wall shall project not less than 120 millimetres from the face of each side of such wall, and the piers, if any, in such wall shall not overhang such foundation.

(4) The upper surface of such foundation shall be not less than 150 millimetres below the adjoining finished ground-level at any point.

TABLE XIII

EMPIRICALLY CONSTRUCTED BRICK FREE-STANDING WALLS

1	2	3	4	5
	Piers			
Minimum thickness, millimetres	Minimum dimensions, including thickness of wall, in millimetres	Maximum spacing, centre to centre, in metres	Maximum height above finished ground-level, in metres	Minimum dimensions of foundations width × depth, in millimetres
100	—	—	1,0	450 × 200
100	230 × 115*	2,4	1,4	450 × 250
215	—	—	1,7	550 × 250
215	330 × 215*	4,0	2,1	630 × 250
330	—	—	3,0	800 × 250

* The largest dimension to be constructed at right-angles to the wall.

(5) Such foundation shall be of concrete which shall comply with the relevant requirements of section 14.

(6) No damp-proof course shall be permitted between such wall and its foundation.

DIMENSIONS OF EMPIRICALLY CONSTRUCTED BRICK RETAINING-WALLS

56. (1) Empirically constructed brick non-bearing retaining-walls shall conform to the dimensions and be subject to the conditions prescribed in subsections (2) to (9).

(2) No superimposed loads, except pedestrian traffic, shall be permitted behind the retaining-wall within a distance equal to the height of the wall.

(3) No structure shall be erected on such wall except framed or wired fences not covered with sheeting and not exceeding 1,4 metres in height.

(4) The upper surface of the fill behind such wall shall be approximately level.

(5) Expansion joints shall be provided in such retaining-walls at distances apart not exceeding 24 metres, and, where piers are provided, expansion joints shall bisect piers.

(6) Every such retaining-wall shall be constructed vertical, shall be of the thickness specified in Table XIV, and shall be bonded into or cast integrally with piers which shall be built on the side of such wall remote from the fill and to the full height of such wall:

Provided that, where no details of piers are given in Table XIV, no piers are required.

(7) Every such pier shall have the minimum cross-sectional area set forth in Table XIV.

(8) Every such retaining-wall and its piers, if any, shall be built on a foundation of the minimum dimensions set forth in Table XIV, which foundation shall be constructed of concrete complying with the requirements of section 14.

TABLE XIV

DIMENSIONAL REQUIREMENTS OF EMPIRICALLY CONSTRUCTED NON-BEARING BRICK RETAINING-WALLS AND THEIR PIERS AND FOUNDATIONS

1	2	3	4	5
Maximum height of wall and piers above finished ground-level, metres	Minimum thickness of wall, millimetres	Minimum cross-sectional area of piers: projection × length, millimetres	Maximum spacing of piers, centre to centre, metres	Minimum dimensions of foundations, width × depth, millimetres
0,9	215	—	—	750 × 250
1,2	215	100 × 330	2,4	600 × 250
1,5	215	215 × 440	3,0	700 × 250
1,5	330	—	—	900 × 250
1,7	330	100 × 330	3,0	700 × 250
2,0	330	215 × 440	3,0	850 × 250

(9) The upper surface of such foundation shall be at least 150 millimetres below the adjoining finished ground-level, and neither the retaining-wall nor any associated pier thereof shall overhang such foundation.

(10) Empirically constructed brick retaining-walls which are bearing walls shall comply, *mutatis mutandis*, with the requirements of section 46.

C. MASONRY OTHER THAN BRICK

DIMENSIONAL REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY OF BLOCKS

57. (1) *Thickness of walls.*—Empirically constructed walls of solid, cellular or hollow concrete blocks or of hollow clay blocks shall—

(a) subject to the provisions of subsections (2), (3), (4), (6) and (7), have a thickness not less than that prescribed for brick walls in sections 44 to 56; and

(b) comply with the requirements of subsections (2) to (7).

(2) Where a brick bearing-wall is required to be not less than 100 millimetres in thickness, a block bearing-wall shall be not less than 150 millimetres in thickness, and such walls 150 millimetres in thickness shall be constructed of blocks with a compressive strength at 28 days of not less than 4,9 megapascals, laid in class B mortar, or better:

Provided that walls of a lesser thickness may be permitted, subject to the prior written approval of the local authority.

(3) Where a brick bearing-wall is required to be at least 215 millimetres in thickness, a block bearing-wall shall be at least 200 millimetres in thickness:

Provided that walls of a lesser thickness may be permitted, subject to the prior written approval of the local authority.

(4) The dimensions of panel-walls and of sections of curtain-walls between parallel lines of anchors shall be as follows—

(a) for light-mass construction, as set out in Figure 2;

(b) for construction other than light-mass construction, as for brick construction.

(5) The dimensions of free-standing walls, retaining-walls, parapet-walls and balustrade-walls of blocks shall be not less than the dimensions of such walls of bricks, and all blocks used in such walls shall have a density of not less than 1 400 kilograms per cubic metre.

(6) A block wall which is to support a heavy veneer shall be not less than 200 millimetres in thickness, whether it be bearing or non-bearing.

(7) If, in a two-storey building, an internal wall supporting a flat, heavy roof is higher than 3,3 metres in either the upper storey or the lower storey, the internal wall in the lower storey shall be—

(a) at least 300 millimetres in thickness; or

(b) at least 200 millimetres in thickness and constructed of blocks with a compressive strength of at least 4,9 megapascals, laid in class B mortar, or better.

(8) *Height of walls.*—The maximum height of empirically constructed walls of blocks shall comply with the requirements for brick walls set out in sections 44 to 56:

Provided that—

(a) a bearing-wall shall not exceed three storeys or 12 metres in height, whichever is the lesser; and

(b) a curtain-wall shall not exceed a total height of 15 metres, including a gable; and

(c) cavity bearing-walls of hollow blocks shall be used only in single-storey dwelling-houses.

REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY OF NATURAL STONE

58. (1) *Thickness.*—Empirically constructed natural stone walls shall comply with the following requirements for thickness—

(a) the thickness of ashlar stone walls shall be not less than that specified under the same conditions for solid brick walls in sections 44 to 56;

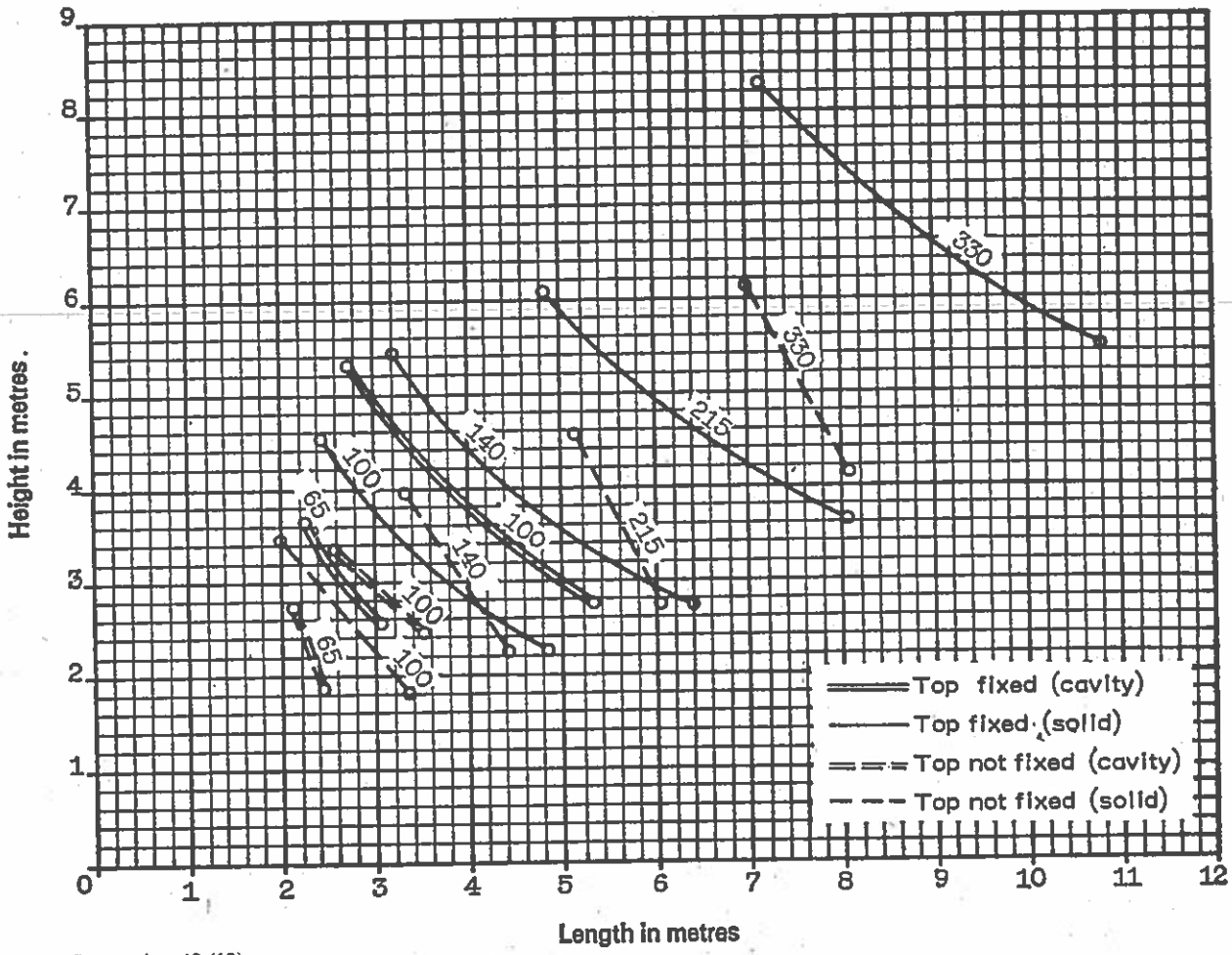
(b) the thickness of squared rubble walls shall be not less than that specified under the same conditions for solid brick walls in sections 44 to 56, and in no case less than 230 millimetres for bearing-walls or less than 150 millimetres for non-bearing walls;

(c) the thickness of random rubble walls shall be 150 millimetres greater than that specified under the same conditions for solid brick walls in sections 44 to 56, and in no case less than 330 millimetres for bearing-walls or less than 230 millimetres for non-bearing walls.

(2) *Height and length of empirically constructed natural stone walls.*—The height and length of any empirically constructed wall of natural stone shall be

FIGURE 2

DIMENSIONS OF EMPIRICALLY CONSTRUCTED PANEL WALL OF LIGHT-WEIGHT BLOCKS (CLASS B MORTAR*)



* See section 42 (13).

as prescribed by sections 44 to 56 for a solid brick wall of the same thickness:

Provided that, in the case of a random rubble wall, the height and length shall be as prescribed for a solid brick wall having a thickness 150 millimetres less than the thickness of the random rubble wall.

(3) *Natural stone retaining-walls.*—Every empirically constructed natural stone retaining-wall shall comply with the following requirements—

(a) it shall comply with provisions of subsections (2) to (5) of section 56 for brick retaining-walls:

Provided that a batter may be used on the outside face of the wall if it does not exceed 1 in 10;

(b) its thickness at the top shall be not less than 230 millimetres, and, at any point below the top, its thickness shall be not less than 40 *per centum* of the height of wall above that point;

(c) it shall be constructed on a concrete foundation at least 250 millimetres in thickness, projecting at least 150 millimetres beyond the edge of the base of the wall at either side, and constructed of concrete complying with the requirements of section 14;

(d) its height shall not exceed 2 metres;

(e) the mortar used in such wall shall be class A mortar.

REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY OF SOIL-CEMENT BUILDING-UNITS

59. Every empirically constructed wall of pre-cast soil-cement building-units shall comply with the following requirements—

(a) a bearing-wall shall have a thickness of not less than 200 millimetres for a solid wall or not less than 150 millimetres for each leaf of a cavity-wall, and every partition-wall shall have a thickness of not less than 100 millimetres;

(b) the storey-height of a bearing-wall shall not exceed 12 times its effective thickness, and

its length shall not exceed 30 times its effective thickness;

(c) wall-sections less than 600 millimetres in length between openings shall be regarded as providing no support to the wall above the openings, and such wall shall, accordingly, be supported by a lintel spanning over both openings; and

(d) every non-bearing wall shall comply with the requirements for a similar non-bearing brick wall, and shall have a minimum thickness of 100 millimetres and be subject to the provisions of section 35.

REQUIREMENTS FOR EMPIRICALLY CONSTRUCTED MASONRY OF GYPSUM BLOCKS

60. (1) Only non-bearing interior walls which are not likely to be exposed to continual dampness may be constructed of gypsum blocks.

(2) The dimensions of walls of gypsum blocks shall comply with the requirements for brick partition-walls set out in section 54.

D. CONCRETE

EMPIRICALLY CONSTRUCTED PLAIN NORMAL CONCRETE WALLS AND COLUMNS

61. (1) Every empirically constructed bearing-wall, pier and column of plain normal concrete shall comply with the requirements of this section.

(2) The effective thickness of such wall shall be not less than that set out in Table XV for the same conditions as those set out in sections 44 to 56 for a brick wall of the corresponding effective thickness.

TABLE XV

MINIMUM EFFECTIVE THICKNESS OF EMPIRICALLY CONSTRUCTED PLAIN NORMAL CONCRETE BEARING WALLS

1	2
Corresponding effective thickness of solid brick wall, millimetres	Minimum effective thickness of concrete wall, millimetres
100	100*
140	125
215	200
330 or greater	50 less than for brick wall

* Minimum actual thickness permitted.

(3) The provisions of subsection (2) shall also apply to the effective thickness of stiffened walls determined in accordance with the provisions of subsections (5) to (10) of section 66.

(4) Reinforcement shall be placed around all openings, and reinforcing bars shall be distant not less than 25 millimetres above and not less than 50 millimetres below, and not less than 40 millimetres horizontally from every edge of every opening, and shall extend for a distance of not less than 48 times the bar diameter beyond the edges of the opening:

Provided that such distance may be reduced by the provision of hooks as specified in Chapter 3.

(5) Instead of providing reinforcement as required in subsection (4), a reinforcing bar may be placed to extend diagonally past each corner of the opening, so as to pass not less than 50 millimetres from such corners and to extend not less than 600 millimetres in both directions from the point nearest to the corner of the opening.

(6) The mass of such reinforcement around openings shall be equivalent to that of one 10-millimetre bar for each 100 millimetres, or remaining portion thereof, of thickness of wall, and it shall be symmetrically disposed in the thickness of the wall.

(7) Plain, normal concrete piers cast integrally with such wall to its full height may be assumed to increase its effective thickness as set out in subsections (6) and (9) of section 66 if such piers comply with the requirements of those subsections.

(8) Plain concrete columns shall be designed in accordance with the requirements of sections 63 to 82.

EMPIRICAL CONSTRUCTION IN NO-FINES CONCRETE

62. (1) Every empirically constructed no-fines concrete bearing-wall shall comply with the requirements of the following subsections.

(2) Its thickness shall be as set out in Table XVI, except that, where it employs light-mass aggregate and supports a flat, heavy roof, it shall be at least 50 millimetres greater in thickness than as set out in Table XVI.

TABLE XVI

MINIMUM THICKNESS OF EMPIRICALLY CONSTRUCTED NO-FINES CONCRETE BEARING-WALLS

1	2	3	4	5
Storey	Minimum thickness of walls, millimetres, for			
	Dwelling-houses		Other buildings	
	External	Internal	External	Internal
Topmost storey or single storey	200	100	200	200
First below topmost storey	200	150	300	200
Second below topmost storey	300	200	Not permitted	

(3) Such wall shall not be used in any storey other than those described in Table XVI.

(4) Where such wall is 200 millimetres or more in thickness, it shall have a storey height not exceeding 3,6 metres, and, where it is less than 200 millimetres in thickness, it shall have a storey height not exceeding 2,7 metres.

(5) Sections of wall between openings shall be not less in width than 450 millimetres, unless bridged over by a lintel as required by sections 17 and 18.

(6) Reinforcement shall be provided around openings as prescribed for walls of normal concrete, except that horizontal reinforcement shall be provided below openings, to allow for differential compression under load, and a lintel shall be provided over each opening, as follows—

(a) for a clear span exceeding 1,5 metres, a lintel of normal reinforced concrete, designed as such;

(b) for a clear span of 1,5 metres or less, a lintel of reinforced no-fines or normal concrete:

Provided that a no-fines concrete lintel shall be not less than 300 millimetres in depth, and shall be reinforced with two 12-millimetre-diameter steel bars or reinforcement of equivalent cross-sectional area.

PART IV

CALCULATED DESIGN OF MASONRY AND WALLING

A. GENERAL

APPLICATION OF CERTAIN SECTIONS

63. The provisions of sections 64 to 82 shall apply in the calculated design of masonry construction.

GENERAL REQUIREMENTS FOR DESIGN

64. (1) Walls, piers and columns shall be so proportioned that the stresses in them due to the worst combination of forces to which they may be subjected[13] do not at any point exceed the values presented in sections 67 to 73 and section 78 for the several materials and conditions to which those sections relate.

(2) Provision shall be made for the transfer of all lateral forces to the ground without causing stresses in excess of those referred to in subsection (1).

DISPERSION AND APPLICATION OF FORCES

65. (1) In considering the transmission of forces through walls and other structural members of masonry and cast-in-situ concrete, the angle of dispersion of the forces through the material shall be taken as being not greater than 45 degrees from the direction of the forces.

(2) Roof-loads from trussed roofs or girder roofs shall be considered as being applied along a line passing through the centre of the bearing-area.

(3) Roof-loads from flat-slab roofs and floor-loads other than those from cantilevers shall be considered as being applied along a line which is related to the width of the bearing-areas as follows—

(a) for slabs of normal concrete employing ordinary aggregate and bearing on the full thickness of the wall, and either extending on both sides of the supporting-wall or extending on one side only of such wall but having an effective span not exceeding 24 times the thickness of such slab, such line shall be assumed to be axial;

(b) for timber floors and for slabs of concrete other than those described in paragraph (a) extending on both sides of the supporting-wall where the span on the one side of the wall does not exceed that on the other side by more than 50 *per centum*, such line shall be assumed to be axial.

(c) for all roofs and floors other than those described in paragraph (a) or (b), such line shall be assumed to be displaced from the centre of the bearing-area towards the span of the roof or floor (where there is only one span) or towards the larger span (where there are two unequal spans), and such eccentricity shall be deemed to be one-sixth of the width of the bearing of the roof or floor, whether or not this width of bearing is equal to the full thickness of the supporting-wall.

SLENDERNESS RATIO

66. (1) *Value of slenderness ratio.*—The slenderness ratio of a wall shall be taken as the ratio of the effective height to the effective thickness, or that of the effective length to the actual thickness, whichever ratio is the smaller:

Provided that the slenderness ratio of a free-standing wall shall be taken as the ratio of the effective height to the effective thickness.

(2) The slenderness ratio of a column shall be taken as the ratio of the effective height in the direction under consideration to the lateral dimension of the column in the same direction, or to the diameter, where the column is circular.

(3) *Effective length.*—The effective length of a wall shall be taken as two comma five times the unsupported length for a wing-wall, and as the unsupported length for any other type of wall.[14]

(4) *Effective height.*—The effective height of walls and columns for the conditions of lateral restraint indicated in the Table shall be as set out in Table XVII, where H is taken as—

(a) for a bearing-wall or a curtain-wall, the height of the storey;

(b) for a panel-wall or a partition-wall or a column, the actual height from the top of the floor construction to the under side of the floor construction, collar-beam or framework above;

(c) for a free-standing wall or a wing-wall, the actual height.

(5) *Effective thickness.*—The effective thickness of a solid wall, without piers, shall be the actual thickness of such wall.

(6) The effective thickness of a solid wall stiffened by piers bonded thereto shall be obtained by multiplying the actual thickness of such wall by the factor

[13] The minimum forces for which provision must in all cases be made are set out in Chapter 3.

[14] See definition of "length of wall".

TABLE XVII

EFFECTIVE HEIGHT OF WALLS AND COLUMNS

1	2	3
Member	Condition of restraint at top[15]	Effective height
Walls	Fully restrained	0,75 H
	Moderately restrained	1,0 H
	Unrestrained	1,5 H
Columns	Fully restrained	1,0 H
	Unrestrained	2,0 H

given for the dimensions and spacing of the piers in Table XVIII if the width of the pier parallel to the length of the wall is not less than twice the actual thickness of the wall, t_w, and the total thickness of the pier (including the thickness of the wall), t_p, is not less than $2t_w$:

Provided that bonded intersecting-walls of a thickness not less than t_w may be regarded as piers of effective pier-thickness t_p[14] equal to half the unbroken length of the intersecting-wall plus the thickness of the stiffened wall.

TABLE XVIII

FACTORS FOR EFFECTIVE THICKNESS OF STIFFENED MASONRY AND CONCRETE WALLS

(Effective thickness = actual thickness × factor)

1	2	3	4	5	6
Ratio of pier-spacing, centre to centre, to pier-width	6 or less	8	10	15	20 or more
Factor for $\frac{t_p}{t_w} = 2$†	1,4	1,3	1,2	1,1	1,0
Factor for $\frac{t_p}{t_w} = 3$† or more	2,0	1,7	1,4	1,2	1,0

† For intermediate values of t_p/t_w the value of the factor shall be found by linear interpolation.[16]

(7) When the thickness of a wall is changed between the bottom and the top of a storey or of a wall, its effective thickness shall be calculated by multiplying the thickness of each section of constant thickness by its height and dividing the sum of their products by the total height of the wall.

(8) The effective thickness of an unstiffened cavity-wall shall be found from the expression $t_e = \frac{2}{3}(t_o - w)$, where—

t_e = effective thickness; and
t_o = overall thickness; and
w = width of cavity.

(9) The effective thickness of a cavity-wall stiffened by piers shall be taken as the effective thickness of the unstiffened wall multiplied by the factors specified in Table XVIII for the size and spacing of piers concerned:

Provided that—

(i) the over-all thickness of the wall, t_o, shall be used in the place of t_w in determining the minimum size and spacing of piers; and

(ii) piers are bonded to one leaf of the wall.

(10) Where, in a cavity-wall, one leaf is designed to carry the total superimposed load, the permissible stress for that leaf shall—

(a) be based on the slenderness ratio calculated from the effective thickness of the whole wall; or

(b) be taken as the actual thickness of the load-bearing leaf;

whichever gives the smaller value of the slenderness ratio.

(11) *Permissible limits of slenderness ratio.*— The slenderness ratio of walls and columns shall not exceed the value given for the relevant conditions in Table XIX.

TABLE XIX

PERMISSIBLE LIMITS OF SLENDERNESS RATIO

1	2	3	4
Class of mortar	Type of member	Maximum value of slenderness ratio	
		Bearing-walls	Non-bearing walls
A, B or C	Unreinforced masonry walls of solid units in dwelling-houses of not more than two storeys	24	40
	Plain concrete walls	24	40
	Reinforced masonry walls and columns; plain concrete columns in dwelling-houses	24	40
	All other types except reinforced concrete walls and columns*	18	40
D	All types	15	24

*Reinforced concrete walls and columns shall have slenderness ratios as set out in Chapter 3.

BASIC STRESSES FOR BRICK MASONRY

67. (1) For solid masonry building-units of the dimensions of bricks, the stresses in masonry due to axial vertical loads calculated as evenly distributed stresses over—

(a) the cross-sectional area of a wall; or

(b) if there are openings in a wall, the reduced cross-sectional area between openings; or

(c) the cross-sectional area of a column;

shall not exceed the stresses set out in Table XX for the compressive strength of such units and class of mortar set out in that Table:

Provided that—

(i) the slenderness ratio does not exceed 12; and

(ii) the compressive strength of such masonry building-units is determined in

[15] See definition of "restrained".

[16] An illustrative figure and curves from which intermediate values may be obtained are set out in the Fifth Schedule.

the manner described in section 5 for the building-units concerned.

TABLE XX

BASIC STRESSES FOR MASONRY WALLS AND COLUMNS

1	2	3	4	5
Compressive strength of building-units, in megapascals	Permissible basic stresses, in megapascals, for			
	Class A mortar	Class B mortar	Class C mortar	Class D mortar
70	2,76	1,86	1,72	0,72
49	2,11	1,50	1,37	0,63
35	1,62	1,22	1,10	0,55
28	1,38	1,05	0,94	0,51
21	1,10	0,90	0,77	0,46
17,5	0,97	0,81	0,68	0,43
14	0,81	0,69	0,58	0,40
10,5	0,67	0,58	0,48	0,36
7	0,48	0,43	0,36	0,29
4,9	0,37	0,33	0,28	0,23
3,5	0,28	0,25	0,21	0,19
2,8	0,23	0,21	0,18	0,16
2,1[17]	0,18	0,16	0,14	0,12
1,4[17]	0,12	0,11	0,10	0,09

[17] These figures have been included to cover the calculation of stresses in non-bearing walls and also to provide for new materials for which strengths lower than 2,8 megapascals may be permitted.

(2) The permissible stresses set out in Table XX shall be designated the basic stresses for masonry.

(3) Basic stresses for intermediate strengths of the building-units aforesaid may be obtained by linear interpolation between the stresses set out in any one column of that Table.

STRESSES FOR LARGE SLENDERNESS RATIOS

68. (1) When all other conditions are as stated in section 67, with the exception that the slenderness ratio exceeds 12, but does not exceed the values set out in Table XIX, then the stresses in masonry shall not exceed the basic stresses set out in section 67 multiplied by the factors set out in Table XXI.

TABLE XXI

STRESS FACTORS FOR SLENDER MASONRY WALLS AND COLUMNS

1	2
For slenderness ratio not exceeding	Factor
12	1,0
14	0,93
16	0,87
18	0,82
21	0,76
24	0,70
27	0,64
30	0,59
35	0,51
40	0,44

(2) The factors corresponding to intermediate slenderness ratios shall be found by linear interpolation.

AXIAL STRESSES IN BLOCK MASONRY

69. (1) The axial stresses in masonry constructed of blocks may be increased to not more than one and a half times the values set out for brick masonry in sections 67 and 68 for the conditions described therein.

(2) The stresses in masonry constructed of cellular or hollow blocks shall not exceed those for solid blocks, and the compressive strength of cellular or hollow blocks, and the stresses on them, shall be computed on their gross cross-sectional area.

(3) The stresses in masonry built of units which have dimensions different from those prescribed for bricks or blocks shall not exceed the following values, based on the height of the units as laid in the wall—

Height of unit, in millimetres	*Permissible stress*
Less than 145	. The stress permitted for brickwork
145 or greater	. The stress permitted for block masonry

AXIAL STRESSES IN CAST-IN-SITU CONCRETE

70. (1) Where the slenderness ratio does not exceed 15, the stresses due to axial vertical loads in—

(a) cast-in-situ plain concrete walls computed as evenly distributed over—

(i) the cross-sectional area of the wall; or

(ii) if there are openings in the wall, over the reduced cross-sectional area between openings;

and

(b) plain concrete columns;

shall not exceed those set out in Table XXII for the appropriate type of concrete.

TABLE XXII

STRESSES PERMITTED IN PLAIN CONCRETE WALLS AND COLUMNS

1	2	3
Type of concrete	Required minimum compressive strength at 28 days, f'_c	Maximum permissible stresses
	megapascals	
Normal employing ordinary aggregate	7,0	1,38, or $\frac{1}{5}$ of f'_c, whichever is greater, but not exceeding 3,5
Normal employing light-mass aggregate	3,5	0.45, or $\frac{1}{5}$ of f'_c, whichever is greater, but not exceeding 2,1
No-fines employing ordinary aggregate	2,45	0,41, or $\frac{1}{6}$ of f'_c, whichever is greater
No-fines employing light-mass aggregate	1,75	0,23, or $\frac{1}{8}$ of f'_c, whichever is greater

(2) Where the slenderness ratio of any wall referred to in subsection (1) exceeds 15, but does not

exceed the values set out in Table XIX, the stress in such wall shall not exceed the figure obtained by multiplying the stress specified in subsection (1) by the appropriate factor set out in Table XXIII.

TABLE XXIII

STRESS FACTORS FOR SLENDER CONCRETE WALLS

1	2	3	4	5	6	7	8	9
For slenderness ratio not exceeding	15	18	21	24	27	30	35	40
Factor	1,0	0,9	0,8	0,7	0,64	0,59	0,51	0,44

AXIAL STRESSES IN NATURAL STONE MASONRY

71. The stresses in masonry constructed of natural stone due to axial loads shall not exceed those set out in Table XXIV for the kind of stone, type of walling and class of mortar set out in that Table:

Provided that, if class A mortar is used, such stresses may be increased to 10 *per centum* of the crushing strength of the stone proposed to be used, as measured on representative samples, to the satisfaction of the local authority.

TABLE XXIV

AXIAL STRESSES PERMITTED IN NATURAL STONE WALLS

1	2	3	4	5
Kind of stone and walling	Maximum permissible stresses, in megapascals, for mortar of			
	Class A	Class B	Class C	Class D
Granite, ashlar . .	5,5	4,4	3,5	2,8
Marble, ashlar . .	3,5	2,8	2,2	1,7
Limestone, ashlar . .	2,1	1,7	1,4	1,1
Sandstone, ashlar . .	1,7	1,4	1,2	1,0
All stones, squared rubble	1,4	1,2	1,0	0,7
All stones, random rubble	0,7	0,6	0,4	Not permitted

STRESSES DUE TO ECCENTRIC OR LATERAL FORCES

72. (1) When eccentric or lateral forces, together with axial loads, have to be taken into account in walls, piers or columns, the stresses shall be calculated on the assumption that the straight-line theory applies to such walls, piers or columns as are subject to bending moments, that is to say that planes in the cross-section remain planes after bending.

(2) On this assumption, the maximum stresses in any part of the walls, piers or columns aforesaid resulting from eccentric loads and lateral forces, together with the axial loads, shall not exceed those set out in Table XXV:

Provided that any excess in compressive stress over that permitted for axial vertical force is due entirely to the eccentricity of forces or to lateral forces.

TABLE XXV

PERMISSIBLE STRESSES, OTHER THAN AXIAL COMPRESSIVE, IN MASONRY

1	2	
Type of stress	Value of stress, in megapascals	
(i) Flexural compressive	1,25 times the average stresses permitted for axial vertical forces for the conditions concerned	
(ii) Tensile, in panel-walls, where such stress is due solely to wind forces	0,21	
(iii) Tensile,* other than that described in (ii)	0,14	
(iv) Shear, for class A mortar	0,14	*or* ⅓ of compressive stress due to dead load if this is greater, but not exceeding 0,21
(v) Shear, for class B mortar	0,10	

* Note that the tensile stress permitted between a damp-proof course membrane and masonry is nil.

STRESSES UNDER CONCENTRATED LOADS

73. When the combined effects of axial, eccentric and lateral forces are all taken into account, the local stresses under the ends of lintels or under column-bases or other concentrated loads shall not exceed the average stresses permitted by sections 67 to 72 for axial vertical loads alone by more than 50 *per centum*.

REINFORCED-CONCRETE WALLS AND COLUMNS

74. (1) *Reinforcement, mixing and placing of reinforced-concrete walls.*—Reinforcing of concrete walls shall be carried out, and the concrete shall be mixed and placed, in accordance with the requirements of Chapter 3.

(2) *Design and thickness of reinforced-concrete walls.*—Reinforced-concrete walls shall be designed and constructed in accordance with the provisions of Chapter 3, and shall in all cases be of the following minimum thicknesses—

(a) basement-walls and foundation-walls, 150 millimetres;

(b) exterior and interior bearing-walls, 100 millimetres.

(3) The thickness of the leaves of cavity-walls shall be not less than that of brick walls under the same conditions:

Provided that—

(i) where 100-millimetre thickness is required for brickwork, 75 millimetres may be used for reinforced concrete;

(ii) in dwelling-houses of a height not exceeding two storeys or 7,5 metres, whichever is the lesser, leaves of cavity-walls may be less than 75 millimetres in thickness, but shall be not less than 40 millimetres in thickness for an un-

supported length not exceeding 24 times the effective thickness;

(iii) in single-storey dwelling-houses, leaves of cavity-walls shall be not less than 50 millimetres in thickness for an unsupported length exceeding 24 times but not exceeding 40 times the effective thickness.

(4) *Reinforced-concrete columns.*—Reinforced-concrete columns shall be designed in accordance with the provisions of Chapter 3.

B. SPECIAL REQUIREMENTS FOR REINFORCED BRICKWORK

GENERAL REQUIREMENTS FOR REINFORCED BRICKWORK

75. (1) The design of buildings and structural members in buildings constructed of reinforced brickwork shall be based on the same general principles of design and analysis as are adopted for the design of similar members and structures of reinforced concrete.

(2) The stresses in such members and structures shall not exceed the limits set out in sections 76 to 82.

MATERIALS FOR REINFORCED BRICKWORK

76. In reinforced brickwork—

(a) bricks shall have a compressive strength of not less than 14 megapascals;

(b) reinforcement shall comply with the requirements for reinforcement set out in Chapter 3;

(c) mortar materials shall be as required by section 5.

MORTAR AND GROUT FOR REINFORCED BRICKWORK

77. (1) Mortar used in reinforced brickwork shall be of class A or class B.

(2) Mortar used for grouting shall be of class A or class B, with additional water in order to produce a consistency which will enable such mortar, or grout, to be poured without causing segregation.

(3) Grout shall not be used in horizontal joints.

PERMISSIBLE STRESSES IN REINFORCED BRICKWORK

78. (1) The stresses in reinforced brickwork shall not exceed, in any part, the values set out in Table XXVI.

(2) The direct compressive stress and the compressive stress due to bending in members with slenderness ratios other than 12 shall not exceed the values set out in Table XXVII for the strength of brick concerned, multiplied by the factor (F) set out in Table XXVIII for the slenderness ratio of the member considered.

TABLE XXVI

PERMISSIBLE STRESSES IN REINFORCED BRICKWORK

1 Type of stress and conditions	2 Maximum value of stress, in megapascals
(a) Direct compressive stress in member with slenderness ratio of 12	As given in Table XXVII for the compressive strength of brick concerned, for class A mortar*
(b) Compressive stress due to bending in member with slenderness ratio of 12	
(c) Shear stress—	
(i) when no shear reinforcement is provided	1 *per centum* of compressive strength of brick, but not exceeding 0,35, for class A mortar†
(ii) when properly designed and anchored shear reinforcement is provided to carry all the shear	3 *per centum* of compressive strength of brick, but not exceeding 1, for class A mortar†
(d) Bond stress—	
(i) between mortar and plain bar reinforcement	0,55 for class A mortar 0,35 for class B mortar
(ii) between mortar and deformed bars, as set out in Chapter 3	1,1 for class A mortar 0,7 for class B mortar
(e) Tensile stress in brickwork	Nil
(f) Tensile stress in reinforcement of—	
(i) mild steel	126
(ii) medium-tensile steel	140
(iii) other types of steel	half of the guaranteed yield stress or 0,3 *per centum* proof stress, but not exceeding 189
(g) Compressive stress in reinforcement	The actual compressive stress in the surrounding brickwork multiplied by the value of "m" set out in column 4 of Table XXVII for the strength of the bricks used

* For class B mortar, stress shall not exceed 0,6 times stress permitted for class A.

† For class B mortar, shear stress shall not exceed half of the stress permitted for class A.

DETAILED REQUIREMENTS FOR REINFORCED-BRICK COLUMNS

79. In reinforced-brick columns, the following requirements shall be complied with—

(a) the total cross-sectional area of the longitudinal steel reinforcement shall be not less than 0,4 *per centum* and not more than 4 *per centum* of the gross cross-sectional area of the column;

(b) there shall be at least one bar for each salient angle in the cross-section of the column;

(c) lateral ties shall be provided of a total volume of not less than 0,4 *per centum* of the gross volume of the column, and shall have a diameter of not less than 6 millimetres;

TABLE XXVII

PERMISSIBLE COMPRESSIVE STRESSES FOR CLASS A MORTAR AND ASSUMED MODULAR RATIOS IN REINFORCED BRICKWORK

1	2	3	4
Compressive strength of brick	Maximum permissible direct compressive stress	Maximum permissible compressive stress due to bending	Corresponding modular ratio "m"*
	megapascals		
Exceeding 56 . . .	3,7	4,7	12
Exceeding 49 but not exceeding 56 . .	3,3	4,1	15
Exceeding 42 but not exceeding 49 . .	2,9	3,7	18
Exceeding 35 but not exceeding 42 . .	2,5	3,1	21
Exceeding 28 but not exceeding 35 . .	1,7	2,1	24
Exceeding 21 but not exceeding 28 . .	1,5	1,8	27
Exceeding 14 but not exceeding 21 . .	1,2	1,5	30

* The value of "m" is the assumed ratio of the elastic modulus of steel to that of brickwork of bricks of the corresponding strength shown.

TABLE XXVIII

FACTORS FOR SLENDERNESS RATIOS OF REINFORCED BRICK MEMBERS

1	2	1	2
Slenderness ratio	Factor F	Slenderness ratio	Factor F
1	1,54	16	0,87
2	1,45	18	0,82
4	1,30	21	0,76
6	1,18	24	0,70
8	1,11	27	0,64
10	1,05	30	0,59
12	1,00	35	0,51
14	0,93	40	0,44

(d) the lateral ties shall have their ends anchored, welded together or lapped through a distance equal to 50 times the diameter of the tie;

(e) the spacing of the lateral ties shall not exceed 400 millimetres or 16 times the diameter of the longitudinal bars or the least lateral dimension of the column, whichever is the least.

DETAILED REQUIREMENTS FOR REINFORCED-BRICK WALLS

80. In reinforced-brick walls, the following requirements shall be complied with—

(a) where—

(i) the stresses in bearing-walls designed in accordance with sections 75 to 82 exceed those permitted in sections 67 and 68; and

(ii) such walls are required to sustain lateral forces or loads with an eccentricity greater than one-sixth of the thickness of the wall;

the bricks which compose the walls shall be slotted or grooved so as to permit the accommodation of the vertical reinforcement and its required covering of grout without relying on the vertical joints between the bricks;

(b) where openings in the wall have a height greater than 12 times the width of the brickwork between the openings, the walling between the openings shall be designed as a column.

COVER OVER REINFORCEMENT IN REINFORCED BRICKWORK

81. (1) In reinforced brickwork, the reinforcement shall have the cover prescribed by this section:

Provided that the local authority may require a cover greater than that so prescribed where it considers that the latter is not adequate to prevent corrosion of the reinforcement under the particularly corrosive conditions which exist at the building site.

(2) The cover of mortar or grout in the joints between reinforcement and bricks shall be not less than one-quarter of the diameter of bars or thickness of strip, and in no case less than 3 millimetres.

(3) The minimum clear distance, disregarding applied surface finishes, of bar reinforcement from exterior (exposed) faces of brickwork shall be 40 millimetres.

(4) The minimum clear distance, disregarding applied surface finishes, of bar reinforcement from interior faces of brickwork shall be as follows—

(a) for slabs, walls and beams, 20 millimetres or the bar diameter, whichever is the greater;

(b) for columns, 25 millimetres;

(c) for any structural member in contact with the soil, such as a footing, foundation or retaining-wall, 75 millimetres.

MISCELLANEOUS REQUIREMENTS FOR REINFORCED BRICKWORK

82. (1) In reinforced brickwork, the further requirements prescribed in this section shall be observed.

(2) The minimum spacing, anchorage, cranking and splicing of the reinforcement shall conform to the requirements for reinforcement of Chapter 3.

(3) To ensure an effective bond between brickwork and mortar, bricks shall be thoroughly wetted down, but not saturated.

(4) All joints between individual bricks, and all spaces around and between reinforcing-bars or wires, shall be completely filled with mortar or grout, the use of grout being confined to use in vertical joints.

FIRST SCHEDULE (*Section 7 (2) (b)*)

IMPACT TESTS FOR WALLS, INCLUDING PANEL-WALLS

1. For the walls of dwelling-houses, offices and other buildings not likely to be subjected to severe impact forces (such as can be expected in parking-garages and places where heavy boxes, machinery and similar items are handled), impact tests shall be carried out as follows—

2. (1) *Test-wall.* The test shall be carried out either on an in-situ wall (or panel) forming part of the building, or on a precast or prefabricated sample-wall or panel, or on a specially constructed masonry test-wall.

(2) Masonry test-walls shall be 3,6 metres long and 2,7 metres high, built on a layer of bituminized felt and restrained at the two ends over the full height against lateral movement.

(3) Test-walls of other materials (that is to say, not masonry) shall be of the same size, and shall be laterally restrained along all their edges where it is intended to restrain them in practice.

(4) A sample-wall or test-wall shall include a doorway 810 millimetres by 210 millimetres within 300 millimetres of one end of the wall, and the frames and finish shall be as in the construction represented by the test-wall.

Sandbag test

3. (1) *Point of impact.*—The point of impact shall be 900 millimetres up from the floor or ground-level, and at midlength, except where there is a centrally situated window or other opening in the wall at the height of impact, in which case the point of impact shall be 230 millimetres from the edge of the opening, or, where an adjacent opening is less than 450 millimetres distant, it shall be midway between the openings.

(2) *Apparatus.*—A leather sandbag 250 millimetres in diameter and of mass 27 kilograms so suspended that, when hanging freely, it just makes contact with the wall.

(3) The height of swing of the sandbag shall be measured vertically from the centre of gravity of the sandbag when it is at rest against the wall to the centre of gravity of the sandbag at the point of release.

(4) The point of suspension of the bag shall be not less than 450 millimetres above the centre of gravity at the highest point of release.

(5) *Procedure.*—Draw the bag away from the wall at right angles to the face of the wall, pendulum fashion, until it is at the required height of swing with the centre of gravity of the bag in line with the suspending tendon.

(6) Release the bag to swing back and strike the wall.

(7) Two impacts shall be made on each point tested from each height of swing.

(8) *Compliance.*—An internal masonry or concrete wall shall be considered satisfactory if—

(a) no cracks larger than 0,25 millimetre wide have been caused by the walls being struck twice from a height of swing of 600 millimetres; and

(b) the wall, after being struck twice from a height of swing of 1,4 metres, does not collapse, and is not penetrated, and no part of the wall remains displaced more than 1,25 millimetres in relation to the rest of the wall.

(9) An external masonry or concrete wall shall be considered satisfactory if it shows the same results after being struck twice from each height from heights of swing of 800 millimetres and 1,8 metres, respectively.

(10) Light partitions of boards or sheets of material fixed to a frame shall be considered satisfactory if, after being struck twice from a height of swing of 450 millimetres for internal walling, or 1,4 metres for external walling—

(a) no portion of the partition is permanently displaced in relation to its original position by more than 1/600 of the smaller distance between parallel lateral supports; and

(b) the partition has no residual cracks of width greater than 0,50 millimetres and length greater than 300 millimetres on either face of the wall.

Steel impact-tool test

4. (1) *Apparatus.*—A steel impact-tool of a mass of 2 kilograms and shaped like a cold chisel with an included wedge-angle of 20 degrees between the sloping surfaces and with an edge 40 millimetres wide ground to a radius of 2,5 millimetres, and so suspended by two parallel cords that, when hanging freely, the edge just makes contact with the wall and the axis of the chisel is normal to the face of the wall (the points of suspension shall be level and at least 600 millimetres above the centre of gravity at the highest point of release).

(2) *Procedure.*—Draw the tool away at right angles from the wall, pendulum fashion, until it has been raised to the required height of swing.

(3) Release the tool to swing back and strike the wall with the full length of the edge.

(4) Two impacts shall be made on each point tested from each height of swing.

(5) The test shall be performed on a minimum of six different points of impact on each wall, selected at random:

Provided that—

(i) in the case of hollow-block walls, the points of impact shall be so selected that three are on vertical joints between blocks and three are midway between webs which support the face of the block; and

(ii) in the case of hollow walls of cladding on a framework, the points of impact shall be so selected that three are midway between internal supports to the cladding of the wall and three are 50 millimetres from such supports.

(6) The height of swing for external walls shall be 450 millimetres, and, for internal walls, 300 millimetres.

(7) *Compliance.*—Walls shall be considered satisfactory if, after being tested, the wall or any part of the wall (including the cladding to a hollow wall)—

(a) is not pierced through by the tool; and

(b) has no residual cracks formed of width greater than 0,25 millimetre and length greater than 75 millimetres; and

(c) is not permanently displaced in relation to its position before the test by more than 2,5 millimetres; and

(d) is not indented by the impacts to a greater depth than 1,5 millimetres.

5. If the specimen can be supported horizontally, the tests described in paragraphs 3 and 4 may be performed by dropping the bag or tool vertically from the required height on to the specimen.

6. For walls other than those mentioned in paragraph 1, the impact test shall be as specified by the local authority to represent the value of impacts which may be expected to be actually applied in practice to the walls concerned.

SECOND SCHEDULE (*Sections 6 and 7 (2) (d)*)

MOISTURE PENETRATION TEST FOR WALLS: ARTIFICIAL RAIN TEST

1. The inner surface of the wall shall have been limewashed (to facilitate the detection of moisture under test), and the wall shall be thoroughly air-dry before being tested.

2. The portion of the outer surface under test shall then be continuously sprayed with water in the form of a finely divided spray distributed over the whole area under test at the rate of 40 to 50 millimetres depth of water per hour.

3. Spraying shall be done in a still atmosphere, and shall be continued until the first appearance of dampness on the inner surface of the wall or for the minimum period required for the locality being considered, whichever period is the shorter.

4. Observations shall be made at regular intervals, and the period which elapses between the commencement of spraying and the time at which the first sign of dampness appears shall be recorded.

5. For the localities set out in the following Table, the period mentioned in paragraph 4 shall be not less than that set out in the Table.

TABLE

RAIN RESISTANCE CRITERIA AS MEASURED IN THE STANDARD APPARATUS FOR CERTAIN LOCALITIES

1	2
Locality	Minimum time during which no water should penetrate to the inside surface of a wall under conditions of the artificial rain test, in minutes
Salisbury	360
Bulawayo	300
Gwelo	300
Umtali	360
All other areas	As determined by the local authority

THIRD SCHEDULE (*Section 13*)

TESTING MORTAR CUBES FOR COMPRESSIVE STRENGTH

Cubes of mortar for testing shall be mixed or sampled and cast, cured and tested in accordance with the provisions of B.S. 1881, Methods of Testing Concrete:

Provided that—

(a) the mortar shall be proportioned according to the requirements of section 13, or be sampled as described for concrete cubes;

(b) cubes of class A, class B and class C mortar shall be stored in a temperature of between 26°C and 29°C; and —

(i) kept in the moulds under wet sacks or in a curing-room in which the relative humidity is at least 90 *per centum* for a period of 48 to 52 hours; and

(ii) after such period, removed from the moulds and stored under the same conditions until tested;

(c) cubes of class D mortar shall be kept in the moulds for a period of 48 to 52 hours, but either in the shade at normal temperature and humidity or in the laboratory at a temperature of 25 ± 4°C and at room humidity for the entire curing period, but, if the strength is to be used as a criterion for rejecting the mortar, the laboratory conditions shall be observed for the tests.

FOURTH SCHEDULE (*Section 18*)

REINFORCED CONCRETE LINTELS (PRE-CAST OR CAST *IN SITU*)

Lintels empirically constructed and used in accordance with this Schedule shall be deemed to satisfy the requirements of these by-laws.

(a) Provision for reinforcement.—Reinforcements shall be provided in accordance with the requirements set out in Tables I and II.

(b) Concrete shall be made using a nominal 20-millimetre coarse aggregate and shall have a characteristic strength of 20 mPa.

(c) Cover—

(i) bottom cover. Bottom cover to reinforcement shall be not less than 25 millimetres nor more than 40 millimetres;

(ii) side cover. Wherever only one bar is used it shall be on the vertical centre line of the lintel, and where more than one bar is used the cover shall be a minimum of 25 millimetres.

(d) Construction. Lintels may be pre-cast or cast *in situ*. Round steel bars shall be hooked at both ends.

(e) Orientation. In the case of pre-cast lintels the relative positions of the upper and lower surfaces shall be distinguishable after building in.

(f) Use—

(i) span. The maximum clear span of lintels made in accordance with this Schedule shall be as set out in Tables I and II;

(ii) bearing. The bearing area of lintels made in accordance with this Schedule shall be that area comprising the full width of the wall above the lintel, and shall be not less than one-tenth of the span with a minimum bearing length of 115 millimetres.

(g) Such lintels shall not carry any concentrated loads from a beam or column.

TABLE I.—Two-course (175 millimetres) lintels

Minimum size of reinforcing-bars per 115 millimetres width of wall or part thereof

Maximum clear span of opening	Minimum size of reinforcing-bars	
	Mild steel (diameter)	Cold twisted steel (side)
m	mm	mm
1,00	8	6
1,25	10	8
1,50	12	10
1,75	16	12

TABLE II.—Three-course (265 millimetres) lintels

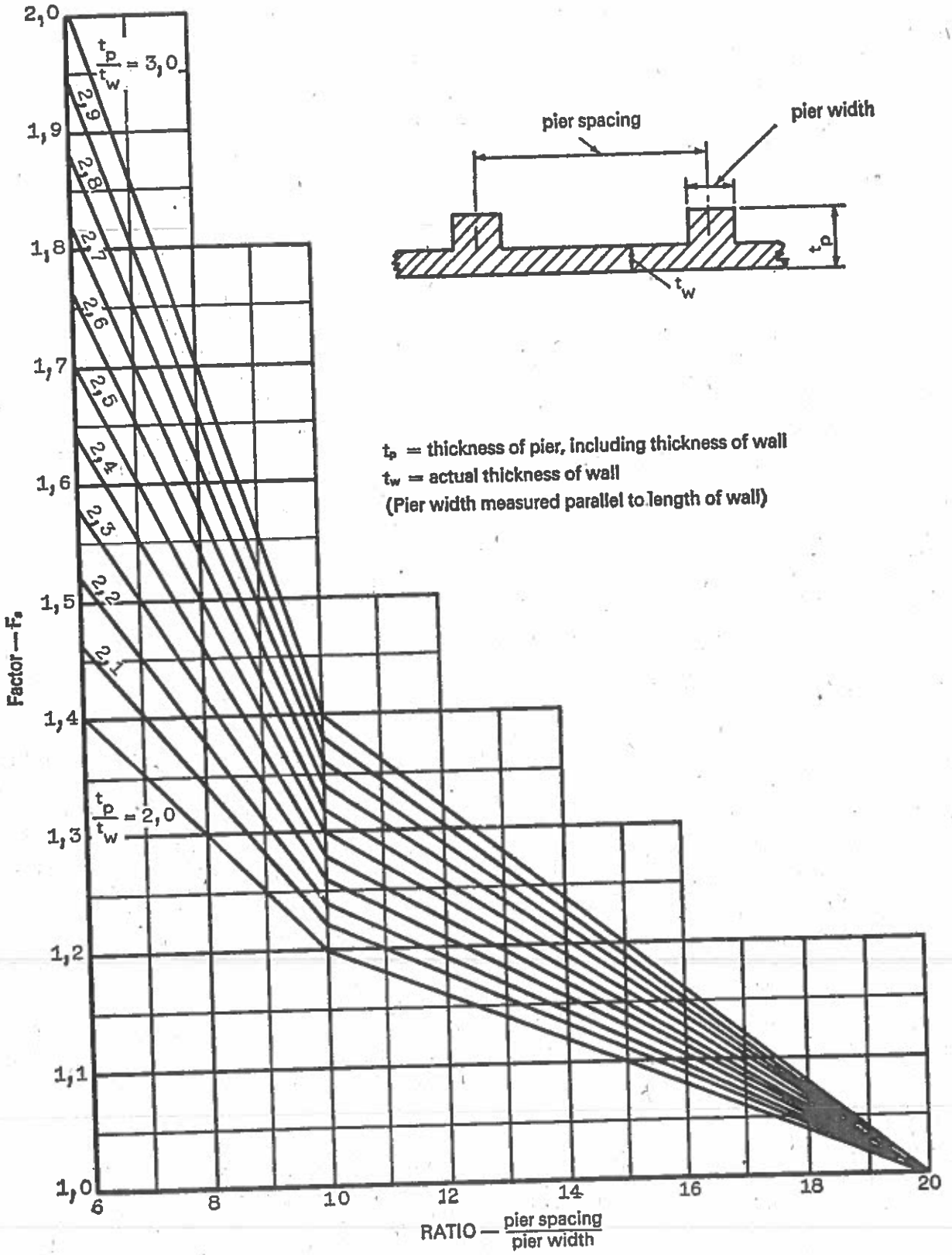
Minimum size of reinforcing-bars per 115 millimetres width of wall or part thereof

Maximum clear span of opening	Minimum size of reinforcing-bars	
	Mild steel (diameter)	Cold twisted steel (side)
m	mm	mm
1,50	8	6
1,75	10	8
2,00	12	8
2,25	12	10
2,50	16	10
2,75	16	12
3,00	20	12
3,25	20	16

FIFTH SCHEDULE (*Section* 66 (6))

FACTORS FOR STIFFENED WALLS
(for guidance only)

FIGURE



Values of stiffening factor F_s for various thicknesses and spacing of piers.
Effective thickness = F_s × actual thickness

INDEX—CHAPTER 6

CHAPTER 6

MISCELLANEOUS MATERIALS AND CONSTRUCTIONS

ARRANGEMENT OF SECTIONS

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"back-filling" means the material with which a trench or excavation is refilled;

"butt exposure" means the length of a slate, shingle or tile which is exposed below the edge of the next row of units above when laid on the roof;

"corrosion-resistant" means having the ability to resist gradual chemical or electro-chemical change caused by atmosphere, moisture or other agents;

"damp-proof" means having the ability to prevent the passage of moisture in the absence of hydrostatic pressure;

"finished ground-level" means the permanent surface of the ground adjoining the building as distinct from the ground-level before commencement of building-operations;

"glazing-bars" means bars made with rebates or of special shapes to support panes of glass in position, and to which the panes may be secured;

"habitable room" means any room designed for human occupation, but excluding bath-rooms, water-closets, stairways, passageways, lift-cars, photographic dark rooms, sculleries, domestic laundries, cold rooms or garages used for parking only;

"roof-pitch" or "roof-slope" means the inclination of a rafter or roof to the horizontal, measured in degrees of arc;

"safety-glass" means laminated safety-glass, solid heat-treated safety-glass (toughened glass), wired glass or polished wired glass;

"side-lap" or "end-lap" means the distance by which one roofing-unit overlaps the next at its side or end;

"waterproof" means having the ability to prevent the passage of water under hydrostatic head;

"water-table" means the level of the free surface of undisturbed water which will stand in any excavation, or the upper limit of the zone of saturation by water in the ground;

"weatherproof" means having the ability to prevent the entry of water into a building under unobstructed conditions of run-off.

PART I

DAMP-PROOFING AND WATERPROOFING

GENERAL REQUIREMENTS FOR DAMP-PROOFING AND WATERPROOFING

2. The following requirements apply regarding damp-proofing and waterproofing—

(a) subject to the provisions of paragraph (c), there shall be provided, in the erection of every building, damp-proofing or waterproofing, in accordance with the requirements of this Chapter;

(b) water or moisture shall be prevented from entering the interior of such building, except as provided for in subsection (6) of section 9;

(c) the local authority may permit the omission of damp-proofing or waterproofing in any building in which there are no habitable rooms, and where the person intending to erect such building can show to the satisfaction of the local authority that no danger to the health of persons or to the stability of the building will be caused by the entry of moisture or water into the building;

(d) damp-proofing and waterproofing materials shall comply with C.A.S. No. A25, Damp-proofing materials, or be other material approved by the local authority;

(e) mastic asphalt damp-proof courses shall be applied in at least two layers;

(f) damp-proofing and waterproofing procedures following S.A.B.S. 021, Waterproofing of buildings, shall be deemed to satisfy the requirements of this section.

DETAILED REQUIREMENTS

3. (1) *Horizontal damp-proof courses.*—Every horizontal damp-proof course shall be constructed to the full width of the wall resting upon it, and shall also extend the full width of any wall-plate which may rest upon the damp-proof course.

(2) For the purposes of this section, a cavity-wall shall be regarded as two separate walls.

(3) Where composed of sheeting, horizontal damp-proof courses shall be lapped not less than 100 millimetres at the joints.

(4) *Vertical damp-proof courses.*—If in any solid wall the horizontal damp-proof course is not situated at least 150 millimetres above the finished ground-level, a vertical damp-proof course (or waterproof course if required) shall be taken up the outer face of the wall from the horizontal damp-proof course to at least 150 millimetres above the external-finished ground-level, and there finished off in such a manner as to prevent the entry of moisture; and shall be protected by brickwork of not less than 65 millimetres in thickness, or by such other method as may be approved by the local authority.

FOUNDATION-WALLS

4 (1) Except as provided for in subsection (4) of section 3, all foundation-walls shall have horizontal damp-proof courses set not less than 150 millimetres above the finished ground-level and also on the underside of any timber in the ground-floor construction which is in contact with such walls, and such timber shall be treated with preservatives and supported as stipulated in the requirements of Chapter 3.

(2) In the case of a floor in contact with the ground, the horizontal damp-proof course in the enclosing walls shall be placed either in the first course above the top-level of the floor and carried down the inner face of the walls to below floor-level, or in the first course below the top of the floor, in which case it shall be carried up the inner face of the walls to above floor-level.

(3) Where an internal wall rests on a suitably strengthened or adequately supported floor in contact with the ground and a horizontal damp-proof course under such floor is not required by the local authority, in terms of the powers conferred on it by subsection (2) of section 8, such a wall shall be built on a damp-proof course laid on the floor.

CAVITY-WALLS

5. In cavity-walls, damp-proof courses shall be provided in such a manner as to—

(a) prevent moisture from the soil or foundation-walls from rising into the wall above the level of the ground-floor or reaching any timber in the floors; and

(b) allow any moisture from the cavity to drain outwards through weep-holes or open vertical joints left at intervals in the outer leaf of such walls.

OPENINGS IN EXTERNAL CAVITY-WALLS

6. In external cavity-walls, damp-proof courses shall be provided at sills and heads of all openings, to prevent the passage of moisture from the outer to the inner leaves of the wall.

PARAPETS AND EXTERNAL PROJECTIONS

7. Damp-proof courses shall be provided to parapets and, where required by the local authority, to external projections in such a manner as to prevent the passage of moisture into the building.

FLOORS

8. (1) *General.*—Solid floors in contact with the ground shall be a minimum thickness of 75 millimetres and shall be so constructed or treated as to render them damp-proof.

(2) Where required by the local authority, a horizontal damp-proof course shall be laid under the floor for its full extent.

(3) *Wash-room and toilet-room floors.*—The floors of wash-rooms and toilet-rooms shall be of tile, terazzo, granolithic or other impervious material, and have a skirting of impervious material of not less than 75 millimetres in height around the walls.

BASEMENTS

9. (1) *Floors.*—Basement-floors shall be—

(a) damp-proof; and

(b) where ground-water is present or is likely to rise above such floor-level and is to be drained away from the building, the floor shall be laid on a layer, of not less than 100 millimetres in thickness, of broken stone, rubble or other fragmented material, the underside of which layer shall be above the top of the footing of any wall or column.

(2) *Walls.*—Basement-walls shall be provided with vertical damp-proof courses where damp-proof courses are required by section 2, and shall be in accordance with the provisions of subsection (4) of section 3.

(3) Where ground-water is present or is likely to rise above basement-floor level and is to be drained away from the building, a layer of fragmented material of not less than 75 millimetres in horizontal thickness shall be placed between the walls and any back-filling. Such layer shall—

(a) communicate with the layer of similar material under the floor; and

(b) extend to a level of 150 millimetres above the highest level of the water-table.

(4) *Junction of floor and wall.*—The junction between basement-floors and walls and columns shall be rendered damp-proof, unless, in the case of internal walls and columns, the floor itself has been rendered damp-proof or waterproof.

(5) *Disposal of ground-water.*—Where ground-water is present or is likely to rise above the basement-floor level and such water is to be prevented from entering the building—

(a) means shall be provided by gravity or by pumping effectively to drain the water from the fragmented material around the walls and from under the floor of the basement; or

(b) the basement shall be made waterproof to a level of at least 150 millimetres above the highest level of the water-table at the site.

(6) Where water is to be allowed to enter any building, weep-holes shall be made in the lowest floor or in the walls at such floor-level, and the water led by channels to a sump from where it shall be pumped away to a discharge-point indicated by the local authority.

PART II

ROOFING

GENERAL

10. (1) *Roof-coverings.*—All roofs and roof projections of buildings shall be weatherproofed and shall be covered with one or more of the coverings detailed in this Part.

(2) The coverings shall be secured so as to withstand climatic conditions, such as wind pressure, wind suction and changes in temperature.

(3) Notwithstanding the restrictions placed on the profiles and sizes of roof-coverings in sections 13 to 21 and the B.S., S.A.B.S. and C.A.S. mentioned therein, alternative profiles and sizes of the respective materials may be used, if approved by the local authority.

(4) *Substructure.*—The trusses, rafters, purlins or other supporting framework to roof-coverings shall be designed in accordance with the respective requirements for concrete, steel or timber, contained in these by-laws.

(5) Timber battens and purlins shall be provided of such strength, dimensions and spacing as shall adequately support the roof covering applied to them, together with all superimposed and wind loads, to the satisfaction of the local authority.

(6) *Roofs with more than one kind of covering.*—Where a roof-covering is provided over another roof-covering, the minimum roof-pitch shall be taken as the minimum pitch allowable.

(7) *Flashing.*—Flashings shall be provided to valleys and the junction of roofs with chimneys, parapets and other abutting surfaces, so as to render the roof weatherproof, and such flashings shall comply with the following requirements—

(a) they shall be corrosion-resistant;

(b) they shall be composed of soft copper, zinc, aluminium, hard lead, galvanized metal, asbestos-cement or other approved material having similar corrosion-resistant qualities. Zinc flashings shall have a mass of not less than 4 kilograms per square metre, and lead flashings of not less than 15 kilograms per square metre. The minimum thickness for flashings of copper, galvanized metal or aluminium shall be 0,55 millimetre. Asbestos-cement flashings shall be at least 5 millimetres in thickness;

(c) whenever a metal flashing or other metal fitting is used in conjunction with a dissimilar metal, whether of the roof or another fitting, which may lead to electrolytic corrosion between them, provision shall be made to prevent such corrosion by painting the contacting surfaces with bitumen-based paint or by any other method which will prevent a galvanic couple being formed;

(d) flashings to the junction of roofs with chimneys, parapets and other abutting surfaces shall be in two pieces. The underneath flashing shall extend at least 100 millimetres up vertical surfaces and shall be covered with the second flashing, which shall be securely wedged and pointed.

MASTIC ASPHALT ROOFING

11. The mastic asphalt used for roofing shall comply with the requirements of C.A.S. No. A1, Mastic asphalt for roofing (limestone aggregate), or shall otherwise be to the satisfaction of the local authority.

BITUMINOUS-FELT BUILT-UP ROOF-COVERINGS

12. Bituminous-felt built-up roof-coverings shall comply with the following requirements—

(a) the exposed layer or layers shall comply with the requirements of C.A.S. No. A30, Bitumen roofing felts, or shall consist of mineral-stabilized asphalt roofing felt surfaced with natural mineral granules of slate or stone rolled into the surface during manufacture in such a manner as to form a closely compacted surface;

(b) unexposed layers shall be of mineral-stabilized asphaltic roofing felt or asphalt-saturated felt;

(c) such coverings shall be laid on a continuous deck of tongue-and-groove wrought timber boarding or concrete or other approved material, with a minimum fall of 1 in 70 towards rainwater outlets;

(d) when the slope of a roof exceeds 1 in 4, the built-up roof-covering shall be fixed to the deck.

ASBESTOS-CEMENT ROOF-SLATES

13. (1) Asbestos-cement slates shall comply with the requirements of B.S. 690 or C.A.S. 198.

(2) Slates shall be laid so that the following requirements are met—

(a) each course shall overlap the second course below it by not less than—

(i) for diamond or honeycomb pattern, 75 millimetres; and

(ii) for rectangular pattern, 100 millimetres;

(b) for diamond- or honeycomb-pattern slates, the roof-slope shall be not less than 25 degrees;

(c) for rectangular-pattern slates, the roof-slope shall be not less than 17½ degrees;

(d) where additional weatherproofing is provided to the satisfaction of the local authority, the roof-slopes referred to in paragraphs (b) and (c) may be reduced.

ASBESTOS-CEMENT ROOF-SHEETING

14. (1) Asbestos-cement corrugated sheets for roofing shall comply with the requirements of C.A.S. 198 or B.S. 690, and asbestos-cement ridging, barge-boards, flashings and other accessories shall be of material of similar quality and thickness.

(2) Except as provided for in subsection (3), where asbestos-cement roof-sheeting is used on a roof, the roof-slope shall be not less than 10 degrees, and the minimum side-laps and end-laps shall be in accordance with Table I.

TABLE I

MINIMUM SIDE-LAPS AND END-LAPS FOR ASBESTOS-CEMENT ROOF-SHEETING

1	2	3
Roof-slope, in degrees	Side-lap, in millimetres	End-lap, in millimetres
More than 17	45	150
More than 12½, but not more than 17	45	225
Not more than 12½	45	300

(3) Where asbestos-cement roof-sheeting is used on a roof and the roof-slope is less than 10 degrees, both side-laps and end-laps must be sealed with a non-hardening compound.

ASBESTOS-CEMENT DECKING-UNITS

15. (1) Asbestos-cement decking-units shall comply with the requirements of B.S. 3717.

(2) Asbestos-cement decking-units shall be laid and fixed to the satisfaction of the local authority.

GALVANIZED-STEEL ROOFING[1]

16. (1) *General.*—Galvanized-steel roofing-sheets shall be not less than 0,55 millimetre in thickness, and the coating shall comply with the requirements of S.A.B.S. 934, Hot-dip (galvanized) zinc coatings on steel sheet and strip.

(2) *Corrugated galvanized-steel roofing.*—Corrugated galvanized-steel roofing shall comply with the following requirements—

(a) except as provided for in paragraph (b), the roof-slope shall be not less than 12½ degrees, and the minimum side-laps and end-laps of the sheets shall be in accordance with Table II;

TABLE II

MINIMUM SIDE-LAPS AND END-LAPS FOR CORRUGATED GALVANIZED-STEEL SHEETS ON ROOFS

1	2	3
Roof-slope, in degrees	Side-lap	End-lap, in millimetres
More than 25	1½ corrugations	150
More than 20, but not more than 25	1½ corrugations	225
Not less than 7, but not more than 20	1½ corrugations	300

[1] Commonly referred to as "galvanized-iron roofing".

(b) where additional weatherproofing, such as the use of an underfelt on timber boarding or caulking of the joints, or other method approved by the local authority, is provided, the slope of the roof may be less than 12½ degrees, and the roof-slope in that case shall be not less than 7 degrees.

(3) *Flat galvanized-steel roofing.*—Flat galvanized-steel roofing shall be laid on a deck complying with the requirements of paragraph (c) of section 12, except that timber decks may be unwrought and butt-jointed.

(4) *Galvanized-steel fluted (inverted box-rib) roofing.*—Galvanized-steel fluted roofing shall comply with the following requirements—

(a) the roof-slope shall be not less than 1 degree with the sheets seam-bolted together at all side-laps with galvanized seam-bolts of not less than 6 millimetres diameter and the minimum side-laps and end-laps of sheets and the maximum seam bolting centres shall be in accordance with Table III;

TABLE III

MINIMUM SIDE-LAPS AND END-LAPS AND MAXIMUM SPACING OF SEAM-BOLTS FOR GALVANIZED-STEEL FLUTED SHEETS ON ROOFS

1	2	3	4
Roof-slope, in degrees	Side-lap ribs	End-lap in millimetres	Maximum spacing of seam-bolts, in millimetres
More than 25 . .	1	150	600
More than 20, but not more than 25	1	180	525
More than 15, but not more than 20	1	200	450
More than 7, but not more than 15	1	230	400
Not less than 5, but not more than 7	1	250	350
Not less than 1, but less than 5 . .	1	300	300

(b) sheets laid at a slope of less than 5 degrees shall have the end-laps sealed with an approved sealing compound.

ALUMINIUM AND ALUMINIUM-ALLOY ROOFING

17. (1) *General.*—Aluminium and aluminium-alloy roofing shall be protected from any dissimilar metal, and from concrete or mortar on which it may rest, by a layer of suitable bitumen-based or coal-tar pitch-based paint between the contact surfaces or by an insulating material approved by the local authority.

(2) *Corrugated-aluminium roofing.*—Corrugated-aluminium or aluminium-alloy roofing shall comply with the following requirements—

(a) where the corrugation pitch is between 65 millimetres and 80 millimetres and the depth of corrugation is 19 millimetres ± 1 millimetre, the thickness of sheet shall be not less than 0,7 millimetre, and the maximum purlin spacing, measured centre to centre, shall be 1,2 metres for the 0,7-millimetre sheet;

(b) the requirements for laps and minimum slope shall be as set out in paragraphs (a) and (b) of subsection (2) of section 16 for corrugated-steel sheets.

(3) *Aluminium flat-sheet roofing laid on a deck.*—Where aluminium or aluminium-alloy roofing in the form of flat sheets is laid on a deck, the following requirements shall be met—

(a) where the roofing is a single-layer weatherproof covering, the minimum thickness of sheet shall be 0,5 millimetre;

(b) the deck shall be continuous and shall comply with the requirements of paragraph (c) of section 12, except that timber may be unwrought and butt-jointed.

(4) *Aluminium-foil built-up roof-coverings.*—Where aluminium foil is used for built-up roof-coverings on a continuous concrete or boarded deck, the following requirements shall be met—

(a) where such foil is used as a single-layer covering for a bituminous-felt built-up roof-covering, or where such foil is used in a built-up roof-covering of successive layers, the thickness of foil shall be not less than 0,05 millimetre and not more than 0,1 millimetre;

(b) where such foil is used as a single-layer covering over concrete roofs or over bituminous felt on a boarded deck the thickness of foil shall be not less than 0,08 millimetre and not more than 0,1 millimetre;

(c) the foil shall be embossed to ensure good adhesion and to allow for expansion;

(d) the deck shall comply with the requirements of paragraph (c) of section 12, or be a shell-type concrete roof, steel-trowelled to a smooth finish after having attained its initial set;

(e) when laid on a flat deck without bituminous felt, a minimum of two thicknesses of foil shall be laid in shingle pattern, with use of an approved grade of hot bitumen or cold adhesive;

(f) when foil is laid over bituminous felt, an approved hot bitumen or cold adhesive shall be used. If only a single thickness of foil is required, there shall be a lap of at least 100 millimetres at any joint;

(g) when foil is laid on shell-type roofs, an approved cold adhesive shall be used. If only a single thickness of foil is required, there shall be a lap of at least 100 millimetres at any joint.

(5) *Aluminium fluted-sheet roofing (long-span custom).*—Aluminium fluted-sheet roofing shall comply with the following requirements—

(a) the roof-slope shall be not less than 3 degrees with the sheets seam-bolted together at all side-laps with aluminium seam-bolts of not less than 6 millimetres diameter, and the

minimum side-laps and end-laps of sheets and the maximum seam-bolting centres shall be in accordance with Table IV;

TABLE IV

MINIMUM SIDE-LAPS AND END-LAPS AND MAXIMUM SPACING OF SEAM-BOLTS FOR ALUMINIUM FLUTED SHEETS ON ROOFS

1	2	3	4
Roof-slope, in degrees	Side-lap ribs	End-lap, in millimetres	Maximum spacing of seam-bolts, in millimetres
More than 15 . .	1	150	600
Not less than 10, but not more than 15	1	230	450
Not less than 3, but less than 10 . .	1	380	300

(b) where the roof-slope is less than 10 degrees, the end-lap shall be sealed with an approved mastic sealer.

COPPER-SHEET ROOFING

18. (1) *General.*—Copper sheets for roofing, including clips, shall be not less than 0,55 millimetre in thickness, and shall be made from hot rolled-sheet copper of dead-soft temper.

(2) *Detailed requirements.*—Copper sheets for roofing shall be laid on a deck complying with the requirements of paragraph (c) of section 12, except that timber decks may be unwrought and butt-jointed.

SLATED ROOFING

19. (1) Roof-slates shall be of an impermeable fine-grained rock, free from knots and knurls, and of such a nature and so located that the durability or weatherproofing of the roof is not adversely affected thereby.

(2) Roof-slates shall, in addition, meet the following general requirements—

(a) every slate shall be of uniform thickness throughout, which shall be not less than—

(i) 5 millimetres for all sizes not larger than 300 × 250 millimetres;

or

(ii) 6 millimetres for all sizes larger than 300 × 250 millimetres;

(b) slates shall have a water absorption not exceeding 0,8 *per centum* of their dry mass, when subjected to the test set out in the First Schedule;

(c) the width of each slate shall be at least half its length;

(d) for slates laid on open battens, the roof slope shall be not less than 30 degrees, except as provided for in paragraph (e), and the sizes of slate used shall comply with those given in Table V for the appropriate roof-slope;

TABLE V

SIZES OF SLATES FOR VARIOUS ROOF-SLOPES

1	2	3
Roof-slope, in degrees	Sizes of slate, in millimetres	
	Length	Minimum width
More than 40 . . .	250–300	150
	360–400	200
	450–500	250
	560	300
More than 35, but not more than 40	250–300–360–400	200
	450–500	250
	560	300
Not less than 20, but not more than 35	250–300	200
	360–400–450–500	250
	560	300

(e) where additional weatherproofing is provided to the satisfaction of the local authority, the roof-slope may be less than 30 degrees, and in that case shall be not less than 20 degrees.

CONCRETE ROOFING TILES

20. (1) *Materials.*—Concrete roofing tiles shall comply with the requirements of C.A.S. 187, Concrete roofing tiles.

(2) *Detailed requirements.*—The following requirements shall be met in regard to the laying and securing of concrete roofing tiles on the roof—

(a) except as provided for in paragraph (b), the roof-slope shall be not less than—

Side-lap	*End-lap*	*Minimum slope*
25 mm	75 mm	26½ degrees
38 mm	108 mm	17½ degrees;

(b) where additional weatherproofing, such as the use of an underfelt or a sheet-metal layer or other method approved by the local authority, is provided, the roof-slope may be less than 17½ degrees, and in that case shall be not less than 15 degrees. If an underfelt is used on boarding, the battens shall be mounted on counter-battens, to ensure drainage.

CLAY ROOFING TILES

21. (1) Marseilles-pattern and plain-clay roofing tiles shall comply with the requirements of S.A.B.S. 632, Clay roofing tiles.

(2) Clay roofing tiles, other than Marseilles-pattern and plain tiles, shall be made accurate to their nominal dimensions with the following tolerances—

(a) thickness: 2 millimetres (for plain tiles only);

(b) breadth: ± 3 *per centum* of nominal breadth;

(c) length: ± 3 *per centum* of nominal length.

(3) *Detailed requirements.*—The detailed requirements for clay roofing tiles shall be in accordance with the provisions of subsection (2) of section 20.

CUT WOODEN SHINGLES[2]

22. (1) *Impregnation and moisture content.*—Cut wooden shingles shall be impregnated in accordance with the requirements of S.A.B.S. 448, South African wood shingles for roofs and walls, and shall also conform to the moisture-content clause of that specification.

(2) *General requirements.*—Cut wooden shingles shall comply with the following requirements—

(a) shingles shall taper from butt to tip and shall be made to the following dimensions—

(i) the nominal lengths of shingles shall be not less than 400 millimetres;

(ii) the widths of shingles shall be any random width from 100 millimetres to 200 millimetres;

(b) the maximum permissible butt exposure shall vary with the roof-slope, in accordance with Table VI;

(c) values of maximum permissible butt exposure for roof-slopes between 26 and 34 degrees, and for shingles of different length from that specified in paragraph (a), shall be obtained by linear interpolation;

(d) in no case shall the roof-slope be less than 20 degrees.

TABLE VI

BUTT EXPOSURE FOR CUT WOODEN SHINGLES

1	2
Roof-slope from the horizontal, in degrees	Maximum permissible butt exposure, in millimetres
More than 34	125
Not less than 26, but not more than 34	95
Not less than 20, but less than 26	95 (plus an undercoat of roofing-felt laid on boarding)

THATCHING[2]

23. The following requirements apply in regard to thatching—

(a) the thickness of the thatching shall be not less than 130 millimetres at any part of the roof, and shall consist of not less than two layers of bundles of thatching;

(b) at eaves and verges, there shall be a layer of bundles of thatching additional to those required by paragraph (a);

(c) at valleys, hips and ridges, approved soakers shall be provided which shall be covered with a layer of bundles of thatching additional to those required by paragraph (a), and the total thickness shall be not less than 200 millimetres;

(d) except as provided for in paragraph (e), the slope of the roof shall be not less than 45 degrees;

(e) when a thickness of thatching double that required under paragraph (a) is provided, the slope of the roof may be reduced to 35 degrees.

GLASS IN ROOFING[3]

24. (1) *General.*—Where glass is employed as a roofing-material or in vertical glazing or louvres at a height of more than 3,5 metres above the level of the interior floor concerned, the glass shall be of one of the types listed in Table VII, and shall comply with the requirements for that type.

TABLE VII

APPROVED GLASSES FOR USE IN ROOFS AND HIGH VERTICAL GLAZING

1	2	3
Type of glass	Minimum nominal thickness, in millimetres	Other requirements
Wired	6	
Solid heat-treated safety-glass (toughened glass)	6	
Glass tiles	6	
Rough-cast domes	9	
Thick rough-cast and polished (plate)	10	
Laminated safety-glass	6	Wholly bonded with an inter-layer not subject to deterioration with age.
Sandwich safety-glass	6	Securely bonded along the entire length of all the edges with materials not subject to deterioration with age.

(2) Notwithstanding the provisions of subsection (1), sheet glass may be used in vertical glazing where the area of any one pane does not exceed 0,25 square metre and is supported on all sides, and, where louvres form a part of the vertical glazing, the nominal thickness of the sheet glass in the louvres shall be not less than 5,5 millimetres.

(3) *Width of flat glass in roofing.*—The maximum permissible width of all types of flat glass referred to in Table VII shall be 600 millimetres, and such glass shall be supported at least along both long edges.

(4) *Roof-slope.*—The minimum roof-slope for glass roofing on a uniform pitch shall be 20 degrees, except in the case of glass tiles, which shall have the

[2] See the requirements of Chapter 11 for restrictions on the use of this type of roofing.

[3] See section 27 for the method of glazing to be used.

same slope as laid down in section 21 for clay roofing-tiles of the same type.

(5) *Glazing-bars.*—Glazing-bars shall conform to the requirements of one of the following paragraphs—

(a) they shall be constructed in accordance with one of the following subparagraphs, being made of—

(i) a steel section sealed with an integrally extruded lead sheath-covering (the mass of lead shall be not less than 10 kilograms per square metre, giving a minimum thickness of 1 millimetre);

(ii) a galvanized-steel bar, the zinc coating of which shall be not less than 600 grams per square metre with a capping of non-ferrous metal;

(iii) a composite bar consisting of a timber supporting bar with a non-ferrous metal section on top to receive the glass, and with a capping of similar metal;

(iv) a reinforced-concrete bar, with approved capping;

(v) a bar of aluminium alloy, with a capping or weathering-wings of aluminium or lead;

or

(b) they shall be made of, or sheathed with, corrosion-resistant material, to the satisfaction of the local authority.

PART III

GLASS, IRON AND STEEL IN BUILDINGS[4]

GENERAL REQUIREMENTS

25. Glass for glazing shall be of the type mentioned, and of the minimum nominal thickness and mass per square metre shown against each individual type in section 26.

MINIMUM NOMINAL THICKNESS OF GLASS FOR GLAZING

26. (1) Subject to the provisions of subsection (1) of section 24 and to the provisions of subsections (3), (4) and (6), the minimum nominal thicknesses and masses per square metre of glass for vertical glazing in buildings, other than roofs, shall be as set out in Table VIII for each type of glass shown.

(2) The maximum glazing-sizes for the corresponding masses per square metre and nominal thicknesses of sheet glass and polished plate glass shall be determined by reference to the Second Schedule and Figures 1 and 2 in the Schedule, and these sizes shall not be exceeded, except where the opening to be glazed is nowhere more than 3,5 metres above the level of the interior floor concerned, when the width may be increased by 20 *per centum*.

TABLE VIII

NOMINAL THICKNESSES AND MASSES OF TYPES OF GLASS APPROVED FOR VERTICAL GLAZING

1	2	3
Type of glass	Minimum nominal thickness, in millimetres	Minimum mass, in kilograms per square metre
Polished plate	6	15
Float	6	15
Sheet	2	5
Cathedral, and figured and rolled	3	7,5
Plain rolled	3	7,5
Rough-cast	5	12,5
Wired	6	15
Polished wired	6	15
Prismatic	6	15
Heat-absorbing	6	15
Solid heat-treated safety-glass (toughened glass)	5	12,5
Laminated	6	14
Sandwich	6	15

(3) Where glass is used in doors, in panes framed on all edges and larger than 0,5 square metre in area, it shall be safety-glass of a thickness to the approval of the local authority for the size of pane concerned.

(4) Where glass doors are unframed, they shall be of safety-glass of thickness to the approval of the local authority.

(5) Where transparent glass is used in doors, either framed or unframed, or in vertical glazing situated between floor-level and a height of 2 metres above floor-level, and, in the opinion of the local authority, the presence of the glass may not be apparent to, or suspected by, a person approaching it, the glass shall bear markings which render the glass clearly apparent, except that, where a close approach to the glass is prevented by barrier-rails or other approved means of preventing an accidental collision with the glass, such markings shall not be required.

(6) Any glass louvre, wherever situated, unless supported on both long edges, shall have a minimum thickness of 4 millimetres and shall have both edges ground smooth.

METHOD OF GLAZING

27. Glazing shall be carried out with such materials as will ensure the glass is securely held in the surrounding frames or openings and is capable of resisting wind pressure and rain penetration, and will not be dislodged by normal movement of frames designed to move to which the glass is fitted.

CAST IRON IN BUILDINGS

28. (1) *Material specification.*—Cast iron used for structural members in buildings shall be of a grade not less than Grade 10 of B.S. 1452.

[4] Hollow glass blocks, although a means of side-lighting, are also non-load-bearing masonry, and they are dealt with in Chapter 5.

(2) *Permissible stresses.*—The permissible stresses in cast-iron structural members shall not exceed the values given below, in megapascals—

Tension in bending	21
Axial tension	21
Shear	14
Axial compression (bearing)	83
Compression in bending	42
Compression in columns	83-28 *l*/*r*

where *l*/*r*, the slenderness ratio, is the ratio of the actual length of the member to the least radius of gyration of its cross-section.

(3) If a cast-iron column is not symmetrical about both longitudinal axes, and is supported laterally between its ends, its slenderness ratio shall be determined by the methods detailed in the appropriate standard mentioned in Chapter 3.

(4) *Columns and compression-members.*—No cast-iron column or other cast-iron compression-member shall have a length, *l*, exceeding 100 times its least radius of gyration, *r*.

(5) The ends of all cast-iron columns shall be fixed in position and direction.

METHODS OF PROTECTION AGAINST CORROSION

29. All iron and steel structures used in building shall be coated to comply with the following codes of practice—

IRON	B.S. CP 2008	Protection of iron and steel structures from corrosion,
STEEL	B.S. CP 2008	Protection of iron and steel structures from corrosion, and
	B.S. 3189	Phosphate treatment of iron and steel.

FIRST SCHEDULE (*Section* 19)

WATER-ABSORPTION TEST ON ROOFING-SLATE

PREPARATION OF TEST SPECIMENS

1. For each test, take at random three slates from the material to be tested, and from each slate prepare a specimen measuring 50 × 50 millimetres × the thickness of the slate. Cut the specimens with a suitable tool, and take care to avoid cracking or splintering the slate. Grind all the edges with water and a fine abrasive to give a smooth finish. Do not use specimens having cracks or other defects caused during their preparation.

WATER-ABSORPTION TEST

2. Dry the three test specimens to constant weight in an oven at 105 degrees Celsius over a period of about 48 hours, and then submerge the specimens in distilled water in a suitable receptacle provided with a reflux condenser and boil gently and continuously for 48 hours. After cooling in air for five minutes, place the specimens in cold water and allow them to stand for 30 minutes in the room in which they are to be weighed. Remove the surplus water by shaking, wipe with a damp cloth and immediately weigh the specimens to the nearest 0,001 gram. Calculate the increase in mass of each specimen as the difference between the mass before and after boiling as a percentage of its dry mass. Take the average of the three values so obtained as the water absorption. If the range of the three values is greater than 10 *per centum* of the average (indicating that defects may have been caused in preparing the specimens), repeat the test using three further specimens. Take the average of the three new values so obtained as the water absorption of the slate.

SECOND SCHEDULE (*Section* 26)

GLAZING-SIZES AND THICKNESSES FOR SHEET GLASS AND PLATE GLASS

SHEET GLASS

1. The height and width of any square or rectangular piece of sheet glass shall be not greater than those given by a point lying on the curve in Figure 1, corresponding to the nominal thickness of the glass concerned.

Examples (*dimensions in millimetres*)—

2-millimetre glass: 375 × 375; or 1 000 high × 300; or 325 high × 500;

3-millimetre glass: 800 × 800; or 1 200 high × 600; or 400 high × 2 500;

4-millimetre glass: 1 300 × 1 300; or 1 700 high × 1 000; or 900 high × 2 500;

5-millimetre glass: 1 800 × 1 800; or 1 600 high × 2 000; or 1 500 high × 2 300.

The maximum permissible diameter of a circular piece of sheet glass is as follows—

For nominal thickness of—
2 millimetres, 500;
3 millimetres, 900;
4 millimetres, 1 450;
5 millimetres, 2 300.

PLATE GLASS

2. The height and width of any square or rectangular piece of plate glass shall be not greater than those given by a point lying on the curve in Figure 2, corresponding to the thickness of the glass concerned.

Examples (*dimensions in millimetres*)—

5-millimetre glass: 1 600 × 1 600; or 2 400 high × 1 200; or 900 high × 7 000;

6-millimetre glass: 2 200 × 2 200; or 4 000 high × 1 400; or 1 300 high × 7 000;

10-millimetre glass: 3 100 × 3 100; or 4 800 high × 2 300; or 2 100 high × 6 000;

12-millimetre glass: 4 000 × 4 000; or 4 600 high × 3 600; or 2 900 high × 7 000.

The maximum permissible diameter of a circular piece of clear plate glass is as follows—

For nominal thickness of—
5 millimetres, 1 900;
6 millimetres, 2 400;
10 millimetres, 3 600;
12 millimetres, 4 600.

FIGURE 1

GLAZING-SIZES FOR SHEET GLASS

(wind force: 600 pascals)

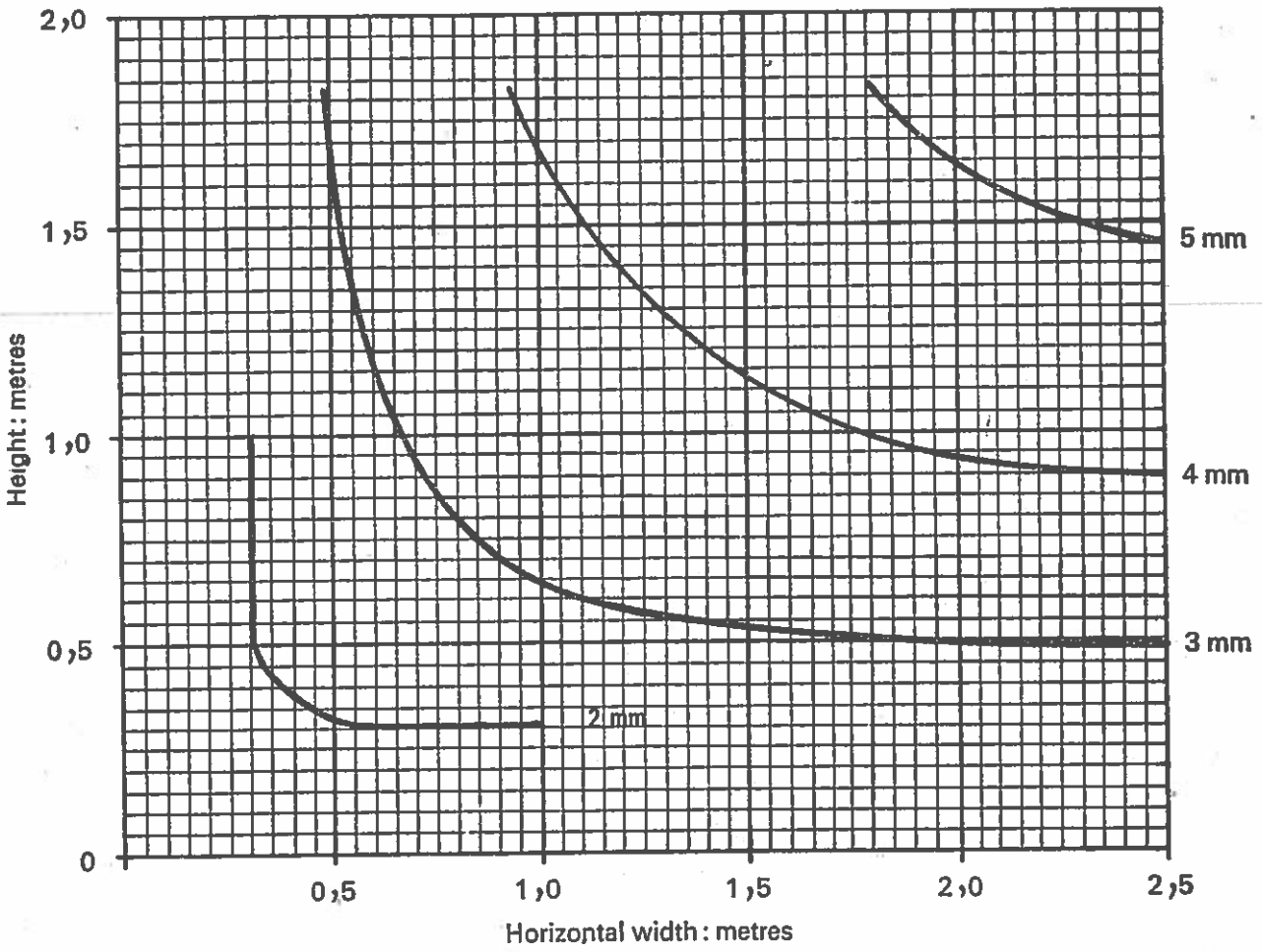
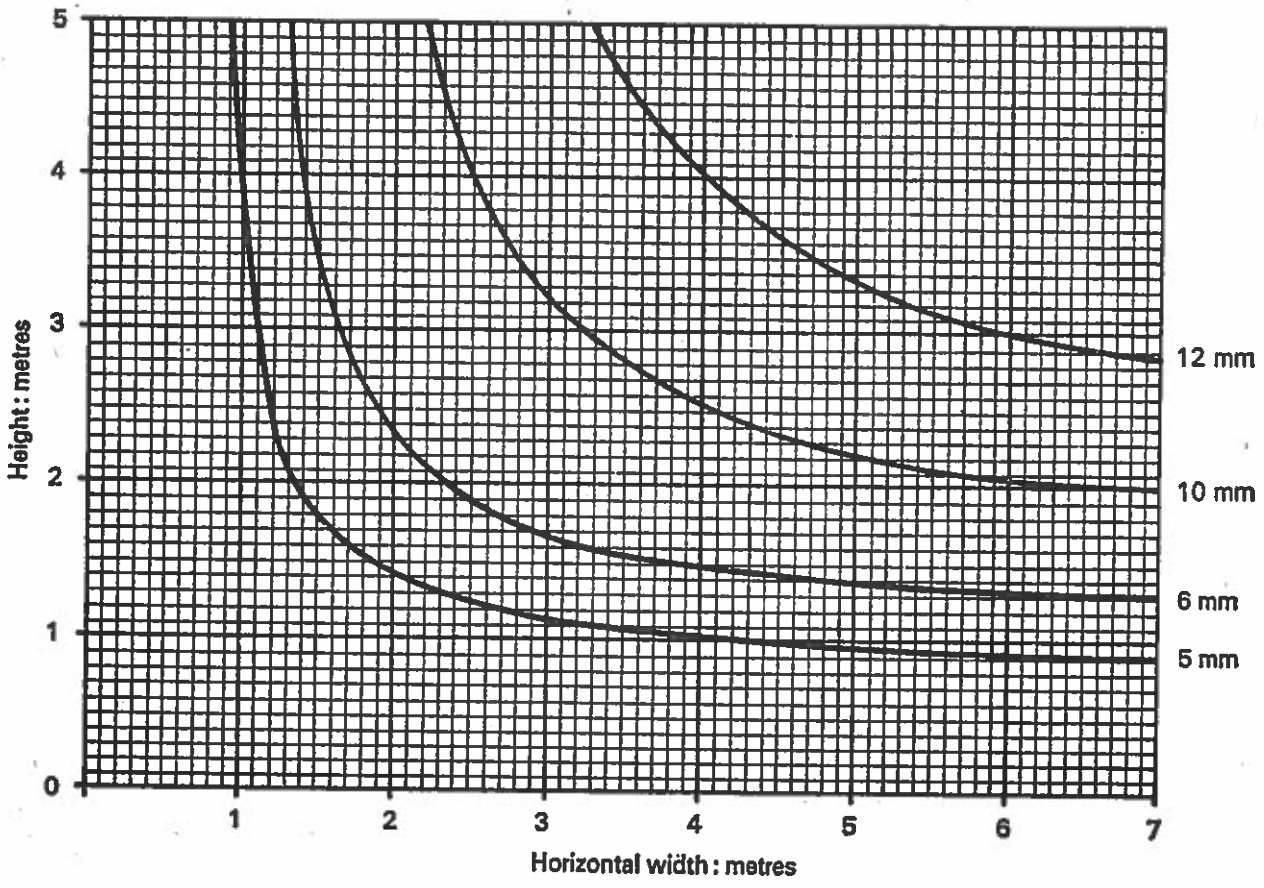


FIGURE 2

GLAZING-SIZES FOR PLATE GLASS

(wind force: 600 pascals)



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CHAPTER 7

WATER-SUPPLY

ARRANGEMENT OF SECTIONS

PRELIMINARY

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"communication-pipe" means any pipe leading from a main to the premises of any consumer as far as the street boundary of such premises situated nearest to such main or, in cases where a meter is installed inside the premises of any consumer, as far as the inlet of the meter;

"consumer" means the occupier of any premises which the local authority has agreed to supply with water, or the owner of such premises, or any other person who has entered into an agreement with the local authority for the supply of water or who is lawfully obtaining water from the local authority;

"main" means any pipe, aqueduct or other work under the exclusive control of the local authority and used by it for the purpose of conveying water to consumers, but shall not include any communication-pipe;

"plumbing system" means the system for the conveyance of the water supply within the boundary of any premises to the various sanitary fittings on such premises, and the conveyance of waste water, soil-water, or other waste liquid, to the private sewer or combined private sewer, as the case may be;

"plumbing work" means work in connexion with the installation, alteration, repair or maintenance of a plumbing system;

"service" means all pipes, fittings and apparatus except any portion of the communication-pipe or the meter, used or intended to be used for or in connexion with the supply of water by the local authority, and situated on the premises occupied or owned by the consumer;

"service-pipe" means any pipe included in any service.

CONNEXIONS TO MAINS

2. (1) No person other than an authorized employee of the local authority shall make any connexion to any main or communication-pipe:

Provided that the connexion of the service to the end of the communication-pipe or, where a meter or meter assembly is installed by the local authority inside any premises, to the outlet from such meter may, with the consent of the local authority, be made by the consumer.

(2) No person other than a person who has entered into a contract with the local authority for the supply of water and has otherwise complied with the provisions of this Chapter shall take any water from or make or cause to be made any connexion with any main, communication-pipe, reservoir, hydrant, conduit, cistern, storage tank or other thing containing water belonging to the local authority.

CONNEXIONS TO OTHER SUPPLIES

3. (1) No service-pipe, storage tank, cistern or apparatus for storing or conveying water supplied by the local authority shall be directly connected with any other system of water-supply except with the prior written consent of the local authority.

(2) No service-pipe used for conveying water supplied by the local authority shall be connected to any cistern, butt or other receptacle used or intended to be used for the reception or storage of water obtained from any source other than the local authority's mains, or with any wooden receptacle which is not furnished with an approved lining.

MIXING OF RAIN-WATER WITH LOCAL AUTHORITY'S SUPPLY

4. No person shall cause or permit rain-water to flow into any storage tank or cistern supplied with water by the local authority.

PIPES ACROSS STREETS

5. (1) No person shall, without the written permission of the local authority first had and obtained, and except under such conditions as the local authority may prescribe, lay, fix, alter, construct, or cause to be laid, fixed, altered or constructed, any pipe, channel or other conduit on, in or under any street, public place or land vested in, or under the control of, the local authority for the purpose of conveying water, whether such water is derived originally from the local authority's source of supply or from any other source of supply.

(2) Any such permission may be withdrawn by the local authority on not less than one month's notice, in writing.

INSTALLATION AND ALTERATION OF SERVICE

6. (1) Where the local authority has made by-laws providing for the examination and licensing of plumbers, no person other than a plumber licensed under such by-laws shall undertake any plumbing work other than the replacement, rewashering and repacking of taps and ball-valves or the cleaning of the waste-pipe of a sanitary fitting.

(2). No person shall cause or permit any service-pipe to be covered in the course of the installation or alteration of a service until such pipe has been examined and approved by the local authority.

(3) When the installation or alteration of any service is ready for inspection, notice thereof shall be given to the local authority.

(4) No service shall be placed in use, and, in the case of fire-extinguishing equipment, no supply of water shall be given, unless and until the service or equipment has been inspected and a certificate of approval issued by the local authority.

(5) Every addition to, or alteration of, a service connected to the local authority's supply system shall be subject to inspection by, and approval of, the local authority.

(6) Every service, and any addition to or alteration of a service, shall, in the event of no certificate of approval being issued, forthwith be altered to comply with the provisions of this Chapter or, failing such alteration, shall be immediately removed.

REPLACEMENT OF EXISTING SERVICE

7. A consumer shall not be required under these by-laws to alter or renew any pipe, fitting, apparatus or other component forming part of the water-service and lawfully existing and in lawful use on any premises immediately before the date of these by-laws becoming applicable to such premises, or to construct or provide any addition thereto, unless and until such pipe, fitting, apparatus or other component is so defective or in such a condition or position as to cause waste, undue consumption, misuse, erroneous measurement or pollution or risk of pollution of the water supplied by the local authority.

PART I

MATERIALS TO BE USED IN PROVISION OF SERVICE

PIPES

8. (1) Service-pipes and circulating or supply-pipes for hot water shall be made of lead, galvanized steel or copper:

Provided that—

(i) piping of other materials may be used with the prior written permission of the local authority; and

(ii) service-pipes for cold water and not used in any position which, in the opinion of the local authority, is exposed, may be made of asbestos-cement or black polythene piping to the requirements of C.A.S. 177 or of U.P.V.C. piping to the requirements of C.A.S. No. K21.

(2) All steel water-pipes shall comply with the requirements of C.A.S. 102 or B.S. 1387 for medium- or heavy-duty tubes, and the thickness of such pipes used in any particular service shall be not less than as specified in C.A.S. 102 or B.S. 1387 for the appropriate working pressure indicated by the local authority for the locality concerned.

(3) All steel water-pipes shall be galvanized or, where the diameter of the pipes is large enough to permit of other types of protection, shall be otherwise protected against corrosion, to the satisfaction of the local authority.

(4) Lead water-pipes shall comply with the relevant requirements of B.S. 602, Lead and lead alloy pipes for other than chemical purposes.

(5) Copper water-pipes shall comply with the requirements of S.A.B.S. 460, Copper and copper alloy tubing.

(6) The diameters of piping referred to in these by-laws relate to nominal internal diameters.

(7) No service-pipe shall be less than 12,5 millimetres in diameter.

(8) Pipework must be adequately sized to serve all outlets at all times.

STORAGE TANKS, CISTERNS AND CYLINDERS

9. (1) Steel cisterns and covers, storage tanks and cylinders used in any service shall comply with the requirements of B.S. 417, Galvanised mild steel cisterns and covers, tanks and cylinders.

(2) Copper cylinders used in any service shall comply with the requirements of B.S. 699, Copper cylinders for domestic purposes.

TAPS AND FLUSHING-VALVES

10. (1) No person shall install, or cause or permit to be installed, on any service, any tap or flushing-valve unless such tap complies with the requirements of S.A.B.S. 226, Water taps or such flushing-valve has been tested and has been approved by the local authority.

(2) Where such flushing-valves are used on supply-pipes connected directly to sanitary fittings, they shall be provided with a device which effectively prevents back-flow into the supply-pipe.

JOINTS

11. No joints except standard screwed joints, wiped plumbing or other joints approved by the local authority shall be used on any service-pipe.

PART II

INSTALLATION OF SERVICE

APPLICATION FOR SUPPLY

12. An application for the supply of water shall be made to the local authority on the form provided by the local authority for the purpose, and the applicant shall state for what purpose the water is required, and shall sign the form of application indicating acceptance of the conditions of supply as set out thereon.

PRESSURE

13. Where application is made for a supply of water for premises situated at a level above that which can be efficiently serviced by the normal pressure in a local authority main, or where a supply is required for such premises, the applicant or consumer shall accept the supply from the local authority at such pressure as is available at the site of such premises, and the applicant or consumer shall be responsible for the provision and maintenance of adequate water-supply to the services on such premises to the approval of the local authority.

FAILURE OF SUPPLY

14. The local authority shall not be liable for any loss or damage resulting from any failure to supply water or from any failure, disruption or interruption of its water-supply system from any cause whatsoever, or from any fluctuation or drop in pressure at any time at any point in such system, or for any defect in the quality of water supplied, and the consumer shall take such precautions as he deems necessary to meet such an eventuality.

PROVISION AND POSITION OF STOP-COCK

15. The consumer shall provide and install a stop-cock at a point determined by the local authority on the service-pipe inside the boundary of the consumer's premises.

SUPPLIES FOR GROUPS OF PREMISES

16. (1) Where a group or block of dwellings is supplied from one connexion pipe, a stop-cock shall be fixed on each branch-pipe leading therefrom to each dwelling for the purpose of turning off the supply of water to such dwelling without interrupting the supply to the others.

(2) Where a tap is fixed to a stand-pipe from which water is intended to be supplied to more than one dwelling as aforesaid, such tap shall be of an approved self-closing type.

LAYING OF PIPES

17. (1) All service-pipes laid in the ground shall have a minimum clear cover of 400 millimetres.

(2) No person shall lay or install or make use of any pipe which is to be supplied with water by the local authority through, in or into any sewer, drain, ash-pit, manure-hole or other place where, in the event of the pipe becoming unsound (and such unsoundness being liable to escape immediate detection), the water conveyed through such pipe might be polluted or might escape without being detected:

Provided that, where it is impracticable to lay or install any pipe otherwise than in the manner aforesaid, the part of such pipe so laid or installed shall be carried through a cast-iron or other approved tube or box of sufficient length and strength, and of such construction, as will, in the opinion of the local authority, afford proper protection to the pipe lying within it, and in such manner as will render any leakage or waste from such pipe readily perceptible.

(3) All service-pipes except those laid in the ground shall be securely fixed at intervals, to the satisfaction of the local authority, to the wall or other rigid structure along which they pass.

(4) All stand-pipes or other pipes projecting above the ground and not otherwise secured shall be securely fixed to a stake securely driven into the ground, or by other means approved by the local authority, in such a manner as to prevent undue movement of such stand-pipes or other pipes.

MAINTENANCE OF SERVICE

18. (1) No consumer shall fail to repair, renew, remove or alter any pipe, valve, stop-cock, cistern or other apparatus which is connected to a water-supply from a public main, when called upon to do so by the local authority for the purpose of preventing waste, nuisance, undue consumption or contamination of the supply.

(2) No person shall cause or permit any pipe, fitting or tap to be installed in such position that any leakage cannot readily be detected.

PLUG-VALVES AND GATE-VALVES

19. Except in the case of cisterns for slop-hoppers, water-closets or urinals, a plug-valve or gate-valve shall be placed on the outlet pipe of each cistern so as to obviate the necessity of emptying the cistern during any repairs to the service.

STORAGE TANKS

20. (1) No person shall install, fit or use, or cause or permit to be installed, fitted or used, upon any premises, a storage tank for the reception or storage of water unless—

(a) such storage tank is constructed of cast iron, galvanized steel, vitreous enamelware, concrete, asbestos-cement, copper, glass reinforced plastic, or other approved material, which other material shall, where deemed necessary by the local authority have an approved lining;

(b) such storage tank is watertight and properly covered and ventilated;

(c) the inlet thereof is provided with an approved ball-valve or check-valve;

(d) such storage tank is placed in an accessible position and means are provided to the approval of the local authority for it to be inspected and cleansed;

(e) a gate-valve is provided upon the inlet-pipe, adjacent to such storage tank, and in such a position as to be easily accessible at all times;

(f) such storage tank is provided with an overflow or waste-pipe the situation of which shall admit of the discharge of water being readily detected.

(2) Every steam-engine and boiler, and all premises which require a continuous supply of water, shall have a storage tank holding not less than half a day's supply, calculated according to the average daily consumption.

SEPARATE COLD-WATER STORAGE TANKS

21. Subject to the provisions of subsection (2) of section 20, where a separate cold-water storage tank is installed—

(a) if such storage tank is used to supply a hot-water apparatus and a bath, the cold-water supply to such bath shall not be connected to the storage tank at a point lower than one-half the depth of the storage tank;

(b) any separate cold-water storage tank, if fixed in a roof, shall be placed within a metal tray having sides at least 70 millimetres deep, and being of such dimensions that a space of at least 70 millimetres exists between the sides of the tray and the outside of the storage tank;

(c) the tray shall be provided with a discharge-pipe of larger diameter than the storage tank-feed, and shall be so situated as to permit ready detection of the discharge of water.

STORAGE TANKS IN GROUND

22. No storage tank or other container buried or installed in any excavation in the ground on the consumer's premises shall be used for the storage or reception of water supplied by the local authority and intended for human consumption without the permission of the local authority and subject to such conditions as it may prescribe.

HOT-WATER CYLINDERS

23. (1) Except in the case of combination cylinders, every hot-water cylinder shall be provided with an expansion pipe discharging direct to the atmosphere in a position where overflow will be readily detected or, alternatively, discharging above the surface-level of the water in the storage tank supplying such hot-water cylinder.

(2) The supply pipe from any separate storage tank to a hot-water apparatus shall be fitted with an easily accessible gate-valve.

(3) Every water-heater shall be so constructed that the heating-unit or units shall remain covered by water under all normal conditions of use and under a temporary failure of water-supply.

FLUSHING-CISTERNS

24. Every cistern for a water-closet, urinal or slop-hopper shall comply with the relevant requirements of Chapter 9.

CONNEXION OF SUNDRY APPARATUS

25. (1) Except where flushing-valves are installed in accordance with the provisions of section 10, no person shall cause or permit any service-pipe to be connected, without the interposition of a storage tank fitted with a ball-valve, to any water-trough, water-closet, urinal, steam- or hot-water boiler, closed water-heater or container or apparatus in which any contaminant is mixed with water supplied by the local authority:

Provided that hot-water cylinders of the push-through type, incorporating approved non-return valves, shall be permitted with prior approval of the local authority.

(2) Every such water-trough, water-closet, urinal, steam- or hot-water boiler, closed water-heater, container or apparatus shall be fed separately and directly from such storage tank, which shall be installed solely for that purpose.

(3) No boiler, hydraulic machine or any apparatus liable to cause shock or vibration to any of the water-pipes shall take a direct supply from the water-main, but shall be supplied from an intermediate suitable storage tank with the supply controlled by a float-valve.

INDEX—CHAPTER 8

CHAPTER 8

LIGHTING

ARRANGEMENT OF SECTIONS

PRELIMINARY

INTERPRETATION OF TERM

1. In this Chapter—

"habitable room" means any room designed for human occupation, but excluding bath-rooms, water-closets, stairways, passageways, lift-cars, photographic dark rooms, sculleries, domestic laundries, cold rooms or garages used for parking alone.

PART I

NATURAL LIGHTING

REQUIRED DAYLIGHT OPENINGS

2. (1) Subject to the provisions of Part II, in all buildings, every habitable room (except shops conducting retail business, restaurants, tea-rooms, store-rooms, cinemas, theatres, bars and kitchenettes having a floor area of less than 5 square metres), shall be provided with openings for the direct admittance of daylight.

(2) Such openings as make up the area required by section 4 are hereinafter referred to as "required daylight openings".

POSITION OF REQUIRED DAYLIGHT OPENINGS

3. Only openings or portions of openings which are situated above the level of 300 millimetres above the floor of a room shall be included in the area of required daylight openings.

AREAS OF REQUIRED DAYLIGHT OPENINGS

4. (1) *General requirements.*—Subject to the provisions of this section, required daylight openings in any room shall have a total area admitting daylight, that is excluding the frame-members, in accordance with the requirements of Table I.

TABLE I

MINIMUM PERMISSIBLE AREAS OF REQUIRED DAYLIGHT OPENINGS

1	2
Type of habitable room	Minimum permissible area of required daylight openings in a room, expressed as a percentage of the floor area of that room.
Kitchen	12
Workshop or workroom .	15
All other habitable rooms .	10

(2) *Required daylight openings under projections.*—If a required daylight opening is overhung by an open veranda, balcony, eaves or other projection so that the projection cuts a line drawn from any reference-point, positioned as described in subsection (4), away from the building in a plane at right-angles to the plane of the wall containing the opening, and at 45 degrees to the horizontal, then the required area of the daylight opening shall be increased by 1 *per centum* of the floor area of such room for every 300 millimetres of projection of such veranda, balcony, eaves or other projection beyond such line.

(3) Where a projection, as described in subsection (2), projects over an opening so as to cut a line drawn

from any reference point (positioned as set out in subsection (4)) away from the building in a plane at right-angles to the plane of the wall containing the opening, and at 30 degrees to the horizontal, that opening shall not be considered a required daylight opening:

Provided that, where there shall be additional natural or artificial sources of light to the satisfaction of the local authority, the provisions of this subsection may be relaxed by the local authority.

(4) Any reference-point referred to in subsection (2) or (3) shall be in the plane of the daylight opening concerned, and within the width of such opening, and at the height of the sill of such opening, or 300 millimetres above the floor-level of the room served by such opening, whichever is the higher level.

ALCOVES IN DAYLIGHTED ROOMS

5. (1) In a room having required daylight openings, the sum of the floor areas of alcoves and the like, which are not directly visible from at least one required daylight opening, shall not exceed 10 *per centum* of the total floor area of the room.

(2) Portions of screens and partitions which are glazed with clear white glass from a height of 1 metre above the floor-level to the top of the screen or partition shall not be regarded as restricting visibility.

MAXIMUM DEPTH OF DAYLIGHTED ROOMS

6. No part of a room having daylight openings shall be farther from the plane of such an opening than the distance, measured perpendicular to that plane, set out in Table II for the area of daylight openings provided in the room.

TABLE II

DEPTH OF ROOM PERMITTED FOR VARIOUS AREAS OF DAYLIGHT OPENINGS

1	2
Area of provided daylight openings in the room, expressed as a percentage of the floor area of that room*	Maximum permissible distance from a daylight opening, expressed in multiples of H**
10	2,0
15	2,5
20	3,0
25	3,5

* For intermediate values of daylight opening areas, the corresponding maximum permissible distance shall be found by linear interpolation.

** H is the height above floor-level of the head of the daylight opening concerned.

OPEN SPACE OUTSIDE REQUIRED DAYLIGHT OPENINGS[1]

7. (1) Unless provided otherwise by any relevant town planning scheme, space outside required daylight openings shall comply with the provisions of this section.

(2) Where a daylight opening faces directly towards a permanently unobstructed open space within the stand on which the building is located, or a street, or a public place, or any combination of these which totals more than 4,5 metres in width, the height of the building above the sill of the daylight opening concerned shall not exceed that shown in Table III, for the "depth-of-open-air-measurement" opposite the daylight opening.

TABLE III

MINIMUM PERMISSIBLE DEPTH-OF-OPEN-AIR-MEASUREMENT OPPOSITE REQUIRED DAYLIGHT OPENINGS

1	2
Maximum permissible height of building above sill concerned, in metres*	Depth-of-open-air-measurement opposite required daylight opening, in metres
6	4,5
9	5,4
12	7,2
15	9,0
18	10,8
21	12,6
24	14,4
27	16,2
30	18,0
36	21,6
42	25,2
48	28,8
60	36,0

* For intermediate values of permissible height of building, the minimum depth-of-open-air-measurement shall be found by linear interpolation.

(3) The "depth-of-open-air-measurement" required in subsection (2) shall be the distance measured in a horizontal plane, at the level of the sill of the required daylight opening concerned, and at right-angles to the plane of the wall-face containing such opening, from the farther boundary of open space, street or public place described in that subsection, to the face of the wall containing the opening:

Provided that, where a cornice, balcony or similar projection from the building containing such opening extends over such line of measurement by a distance greater than 500 millimetres, the measurement shall be made to a vertical line drawn through the edge of the widest overhanging projection.

[1] The requirements of section 7 do not necessarily ensure adequate open space about buildings. This may be controlled by the town planning scheme in force in the area of jurisdiction of the local authority, and such requirements must, if necessary, be amended, to avoid conflict with the town planning scheme.

(4) Where a required daylight opening does not face such open space, street or public place as described in subsection (2), it shall face an unobstructed open space, termed a "required daylight space" which complies with the following requirements—

(a) it shall cover an unobstructed plan area in the shape of a rectangle or parallelogram with dimensions D and W, as described in paragraphs (c) and (d), not less than the dimensions set out in Table IV;

(b) the plan area of the required daylight space shall not be measured beyond the boundary of an adjoining stand, or beyond the centreline of an adjoining street or public place;

(c) the dimension W (the width) of the plan area shall be measured always parallel to the face of the wall containing the daylight opening, and shall, wherever measured, always be bisected by the line of measurement of dimension D, as illustrated in the Figure;

(d) the dimension D (the depth) of the plan area shall be measured from the mid-point of the sill of the daylight opening and at an angle β to the plane of the wall containing such opening, the angle β being not less than 30 degrees, as illustrated in the Figure;

(e) the required daylight space shall be measured clear of any obstructions projecting from the surrounding walls at levels above that of the sill of the daylight opening, unless such projecting obstructions are less than 500 millimetres in width, in which case such obstructions may be disregarded.

(5) If the required daylight space is a parallelogram in plan, the minimum area admitting light of the daylight opening shall be increased above that set out in Table I by the percentages set out in Table V corresponding to the value of the angle β.

TABLE IV

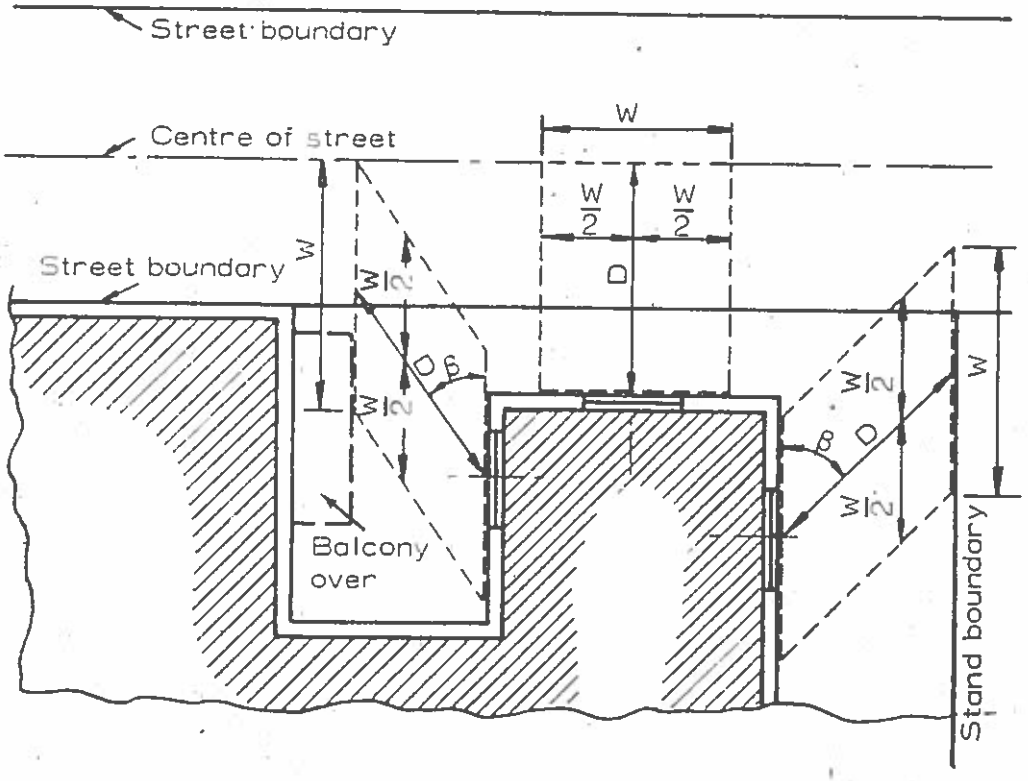
MINIMUM PLAN DIMENSIONS OF REQUIRED DAYLIGHT SPACE IN RELATION TO HEIGHT OF BUILDING

1	2	3
Height of building above sill concerned, in metres*	Minimum permissible measurement D, in metres	Minimum permissible measurement W, in metres
6	1,8	1,85
9	2,7	2,00
12	3,6	2,15
15	4,5	2,30
18	5,4	2,45
21	6,3	2,60
24	7,2	2,75
27	8,1	2,90
30	9,0	3,05
36	10,8	3,35
42	12,6	3,65
48	14,4	3,95
60	18,0	4,55

* For intermediate heights, the values of D and W shall be found by linear interpolation.

FIGURE

REQUIRED DAYLIGHT SPACE



(6) Where the height of the building from the sill of the daylight opening is referred to in subsection (2) and in Tables III and IV, such height shall be measured as the vertical distance from the level of the sill at the daylight opening concerned to the eaves or the top of the parapet, or, where this does not apply, and in the case of stepped buildings, to such other positions as the local authority may consider to be the top of the building containing the daylight opening.

TABLE V

INCREASE IN AREA OF REQUIRED DAYLIGHT OPENINGS IN TERMS OF SECTION 7 (5)

1	2
Angle *β	Percentage by which area required by section 4 must be increased
30	100
32	90
34	80
36	71
38	63
40	56
45	42
50	31
55	23
60	16
65	11
70	7
75	5
80	2
Above 80	Nil

* Where β, as measured, is intermediate to the values given in this Table, the appropriate percentage increase in area of required daylight opening shall be obtained by linear interpolation.

LIGHTING REQUIREMENTS FOR NON-HABITABLE ROOMS

8. Those rooms specifically excluded from the requirements of section 2, and also all non-habitable rooms, shall be provided with means of artificial lighting to the satisfaction of the local authority, or, failing such provision, shall comply with the requirements of section 2 relating to the daylighting of habitable rooms.

PART II

ARTIFICIAL LIGHTING

ARTIFICIAL LIGHTING INSTEAD OF NATURAL LIGHTING

9. The local authority may permit artificial lighting to be used instead of natural lighting in rooms or buildings, taking into account the function of such rooms or buildings.

AUGMENTATION OF NATURAL LIGHTING BY ARTIFICIAL LIGHTING

10. The local authority may require artificial lighting to be provided to augment natural lighting in any case where, in spite of compliance with the provisions of this Chapter, the natural lighting in a room is, in the opinion of the local authority, inadequate.[2]

LIGHTING ON STAIRWAYS AND IN PASSAGES

11. (1) Every owner of a building which contains a stairway or passage designed to be used by more than one tenant shall install and maintain a lighting system capable of producing illumination at any one point of not less than 50 lux on all such stairways or passages.

(2) Lights on landings and on other parts of such a stairway and in a pasage shall be kept on throughout the hours of darkness, or at any time when the illumination would otherwise fall below 50 lux, or switches shall be provided and so arranged that the light may be switched on above or below each flight of stairs or at either end of the passage.

(3) Where passageways and stairways are only artificially lit they shall be provided with emergency lighting of not less than 20 lux at floor level.

FLOOR-LIGHTS

12. Floor-lights of glass or other translucent and brittle material shall not be allowed in floors between the storeys of a building, unless they and their supporting frames are able to sustain the design floor-load and to comply with any other requirements of these by-laws, relating amongst others to fire protection.

PART III

GENERAL

APPLICATION OF CHAPTER 11

13. Lighting arrangements must also comply with the provisions of Chapter 11.

[2]For the guidance of local authorities, a table of standard service illuminance recommended by the Illuminating Engineering Society of London, Great Britain, is set out in the Schedule, and is not to be construed as part of the provisions of this Chapter. The Schedule is not fully comprehensive of all requirements.

SCHEDULE
(for guidance only)

TABLE OF STANDARD SERVICE ILLUMINANCE
(Taken from the Illuminating Engineering Society of London, Great Britain, for various locations and occupations: I.E.S. Code 1973)

	Standard service illuminance lux	Position of measurement	Limiting glare index	Colour appearance of light source
A. LOCATIONS				
Hospitals—				
Laboratories	500	Bench	19	Intermediate or warm
Operating theatres—				
General	400	Trolley height	—	Intermediate
Tables	Special lighting	—	—	—
Wards—				
Bedheads—				
General	30–50	Pillow	—	Intermediate or warm
Reading	150	Book plane	—	Intermediate or warm
Circulation space	150	Bed height	—	Intermediate or warm
Office buildings—				
General office	500	Desk	19	Intermediate or warm
Executive office	500	Desk	16	Intermediate or warm
Conference-rooms	750	Tables	16	Intermediate or warm
Drawing offices—				
Drawing boards	750	Board	16	Cool, intermediate or warm
Reference tables	500	Table	16	Cool, intermediate or warm
Libraries—				
Shelves, book stacks	150	Vertical at floor	19	Intermediate or warm
Reading tables	300	Table	19	Intermediate or warm
Closed bookstores	100	Vertical at floor	19	Intermediate or warm
Book-binding	500	Desk	19	Intermediate or warm
Cataloguing, sorting	500	Desk	19	Intermediate or warm
Public halls—				
Auditoria—				
Multi-purpose	500	Horizontal at seat-level	—	Intermediate or warm
Foyers	75 SCALAR*	1,2 metres above floor	19	Intermediate or warm
Schools—				
Gymnasia	300	Floor	—	Intermediate or warm
Art rooms	500	Easel	19	Cool or intermediate
Kitchens—				
General	500	Working surface	22	Intermediate or warm
Food stores	150	Floor	—	Intermediate or warm
Dining-rooms	300	Tables	22	Intermediate or warm

*The average illuminance over the whole surface of a very small sphere located at a given point.

	Standard service illuminance lux	Remarks
B. OCCUPATIONS		
Rough work	300 to 500	Rough machining and assembling
Routine work	500 to 750	Offices, control rooms, medium machining and assembling
Demanding work	750 to 1 000	Drawing or business machine offices, inspection of medium machining
Fine work	1 000 to 1 500	Colour discrimination, textile processing, fine machining and assembly
Very fine work	1 500 to 3 000	Hand engraving, inspection of fine machining or assembly
Minute work	3 000	Inspection of very fine assembly

Note.—For detailed tables, see the I.E.S. Code 1973, of the Illuminating Engineering Society of London, Great Britain.

INDEX—CHAPTER 9

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"anti-siphon pipe" means any pipe provided in conjunction with a trap in the sanitary fitting to prevent unsealing of the trap by siphonage or back-pressure;

"business building" means any building occupied for the transaction of business or for the rendering of professional services, and includes any building occupied for the display or sale of goods, wares or merchandise, or for the performance of work or labour, and, without in any way limiting the scope of this definition, includes—

bakeries;
banks;
cafés;
creameries;
electricity substations;
factories;
ice-plants;
laboratories;
laundries;
office buildings;
petrol-filling stations;
power-plants;
radio-stations;
restaurants;
telephone exchanges;
workshops;

"drainlayer" means a person undertaking sewerage work;

"institutional building" means any building primarily used for housing persons receiving medical, charitable or other care or treatment, or in which persons are involuntarily detained, and, without in any way limiting the scope of this definition, includes—

crèches;
homes for the aged;
hospitals;
infirmaries;
maternity homes;
mental hospitals;
nursing homes;
nursery schools;
orphanages;
sanatoria;

"junction" means a pipe-junction for the purpose of receiving a private drain or private sewer or a connexion from such drain or sewer;

"one-pipe system" means the system of piping between sanitary fittings and a private sewer, in which both waste and soil-water are permitted to flow down a common stack;

"plumber" means a person undertaking plumbing work;

CHAPTER 9

DRAINAGE AND SEWERAGE

ARRANGEMENT OF SECTIONS

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DRAINAGE AND SEWERAGE

ARRANGEMENT OF SECTIONS

PRELIMINARY

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INTERPRETATION OF TERMS

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"anti-siphon pipe" means any pipe provided in conjunction with a trap in the sanitary fitting to prevent unsealing of the trap by siphonage or back-pressure;

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bakeries;
banks;
cafés;
creameries;
electricity substations;
factories;
ice-plants;
laboratories;
laundries;
office buildings;
petrol-filling stations;
power-plants;
radio-stations;
restaurants;
telephone exchanges;
workshops;

"drainlayer" means a person undertaking sewerage work;

"institutional building" means any building primarily used for housing persons receiving medical, charitable or other care or treatment, or in which persons are involuntarily detained, and, without in any way limiting the scope of this definition, includes—

crèches;
homes for the aged;
hospitals;
infirmaries;
maternity homes;
mental hospitals;
nursing homes;
nursery schools;
orphanages;
sanatoria;

"junction" means a pipe-junction for the purpose of receiving a private drain or private sewer or a connexion from such drain or sewer;

"one-pipe system" means the system of piping between sanitary fittings and a private sewer, in which both waste and soil-water are permitted to flow down a common stack;

"plumber" means a person undertaking plumbing work;

"plumbing system" means the system for the conveyance of the water-supply within the boundary of any premises to the various sanitary fittings on such premises, and for the conveyance of waste water, soil-water or other waste liquid to the private sewer or combined private sewer, as the case may be;

"plumbing work" means work in connexion with the installation, alteration, repair or maintenance of a plumbing system;

"public building" means any building used or intended to be used by persons congregating for civic, political, educational, religious, cultural, social or recreational purposes, or for purposes of sport and, without in any way limiting the scope of this definition, includes—

armouries;
assembly halls;
auditoria;
bath-houses;
bowling alleys;
cinemas;
club-rooms;
colleges and schools (non-residential);
dance-halls;
drill-halls;
exhibition buildings;
grand stands;
gymnasia;
lecture-halls;
libraries;
lodge-rooms;
museums;
passenger-stations;
public swimming-baths;
skating-rinks;
stadia;
theatres;

"residential building" means any building, other than an institutional building, which provides sleeping-accommodation for persons, and, without in any way limiting the scope of this definition, includes—

boarding-houses;
convents;
dormitories;
dwellings;
hostels;
hotels;
lodging-houses;
residential clubs;
residential schools and colleges;

"septic tank" means any covered tank, complete with effluent overflow, intended to receive sewage and designed to retain such sewage for such a time and in such a manner as to secure adequate decomposition of organic solids by bacterial action;

"sewage" means waste water, soil-water or other liquid waste, excluding the water mentioned in the definitions of "private drain" and "public drain" in the Urban Councils Act [*Chapter 214*];

"sewer" means an underground pipe used for conveying sewage, and includes all other things necessary in connexion therewith. Where "sewer" occurs in this Chapter, it shall, unless the contrary intention appears from the context, be construed as meaning a private sewer or combined private sewer;

"sewer connexion" means that portion of a pipe which is provided to connect a private sewer or combined private sewer with a public sewer, and the ownership of which is vested in the local authority;

"sewerage work" means work in connexion with the installation, maintenance, alteration or repair of private sewers or combined private sewers, but shall not include work on sanitary fittings, stack-pipes, rain-water pipes or rain-water gutters;

"single-stack system" means a system in which grouped appliances discharge into a single soil and waste stack, and all traps are unventilated;

"soil-pipe" means a pipe for conveying soil-water from the trap or outlet of a soil-water fitting to a private sewer or combined private sewer;

"soil-water fittings" means all fittings directly appurtenant to the discharge of soil-water, including water-closets, urinals, bidets, slop-hoppers and similar fittings;

"stack" means any vertical or inclined line of waste- or soil-piping, or a combination of both, and the branches connected thereto, which conveys the flow of liquid from waste- or soil-pipes to any gully-trap, channel or sewer, including any vent used in connexion therewith;

"trade or industrial premises" means any premises used or intended to be used for carrying on any trade, manufacture or industry, and which produce a trade effluent;

"trap" means any pipe or fitting so bent or formed that it retains a quantity of liquid, part of which forms a seal or barrier to the passage of air or gas;

"two-pipe system" means the system of piping between sanitary fittings and a private sewer or combined private sewer wherein separate stacks are used to connect soil- and waste-fittings, and on which the waste-water system is completely disconnected from the soil-water system;

"ventilation-pipe" or "vent-pipe" means any pipe or portion of a pipe fitted vertically or at an incline, and provided solely to ventilate a sewerage system and to prevent trap-siphonage or back-pressure;

"waste-pipe" means any pipe connected to any waste-water fitting, and used for the conveyance of waste water to any gully-trap, floor-channel or waste- or soil-stack, but does not include any fitting, gully, channel or sewer into which such waste-pipe may discharge;

"waste-sewer" means such part of a private sewer or combined private sewer as comprises underground piping, and is used or intended to be used for the conveyance of waste water only;

"waste-water fittings" means all fittings directly appurtenant to the discharge of waste water,

and includes baths, wash-basins, gullies, sinks and all other fittings which subserve a similar purpose.

PART I

GENERAL REQUIREMENTS IN RESPECT OF SEWERAGE AND PLUMBING WORK

PREMISES TO BE SEWERED

2. (1) Whenever, in the opinion of the local authority, an adequate water-supply is available, every residential, institutional, business and public building shall be provided with a plumbing system and sanitary fittings discharging into—

(a) a public sewer (if available); or

(b) if a public sewer is not available, into a septic tank or a conserving-tank or other approved means of sewage-disposal.

(2) Subject to the provisions of subsections (3) and (4), the sewerage system of any premises shall be separate and distinct from the sewerage system of every other premises.

(3) In the case of any group or block of buildings, a combined private sewer may be permitted, subject to the approval of the local authority.

(4) In any case referred to in subsection (3), the local authority shall have the right to carry out all, or any portion of, the work, and to recover the cost of construction from the various owners, apportioned by the local authority, in such manner as it may deem to be just.

APPLICATION FOR CONNEXION

3. Application for approval of plans to undertake any sewerage work in terms of section 5 of Chapter 2, shall where applicable, constitute application for a connexion to a public sewer or a public drain:

Provided that where such application relates to trade or industrial premises, special application for permission to discharge any trade effluent into a public sewer or drain shall be made to the local authority on the form provided by the local authority for the purpose.

EXECUTION OF SEWERAGE AND PLUMBING WORK

4. Where the local authority has made by-laws providing for the examination and licensing of plumbers and drainlayers, no person other than a plumber or drainlayer, licensed under such by-laws, shall undertake any plumbing or sewerage work as the case may be other than the replacement, rewashering and repacking of taps and ball-valves, cleaning the waste-pipe of a sanitary fitting and the clearance of obstructions in private sewers.

DISCONNEXION OF SOIL-WATER FITTINGS

5. (1) Where a soil-water fitting is removed, all pipes thereby thrown into disuse shall be removed, or all openings shall be effectively and durably sealed. The owner of the premises upon which such work is carried out, shall, after its completion, notify the local authority thereof in writing.

(2) Where so required by the local authority, the owner of any premises shall, at his own expense, effectively seal the opening of any sewer or drain situated on his premises, and shall maintain such seals until permission for their removal has been given, in writing, by the local authority.

MAINTENANCE OF PRIVATE SEWERS

6. (1) The owner of any premises shall efficiently maintain, repair, cleanse and keep clean, the entire plumbing system and all private sewers on such premises up to but not including the sewer connexion, and shall clear all obstructions in sewer connexions.

(2) In all cases where any person makes, alters or otherwise deals with any sewerage or drainage system in such a manner as to contravene any of these by-laws, or allows or causes any portion of the sewerage or drainage system, for the proper maintenance of which he is responsible, to fall into bad or defective condition, or to become obstructed, such person on receiving notice from the local authority, shall remake, alter, repair, cleanse or remove any obstruction from such sewerage or drainage system within such period as is specified by the notice.

(3) Where the premises of more than one owner are served by a combined private sewer, the owners shall be jointly and severally responsible for maintaining, cleansing or repairing such combined private sewer.

SANITARY FITTINGS REQUIRED

7. (1) Subject to any other law requiring a greater number of sanitary fittings, every residential, institutional, business or public building, categorized in Table I, shall be provided with at least the number of sanitary fittings shown in Table I, and, in addition, the requirements of the following subsections shall be complied with.

(2) Rooms provided in buildings other than dwellings, in which sanitary fittings are installed which are intended for the use of more than one person at any one time, shall be restricted to one sex only.

(3) Whenever water-closet compartments or bathrooms are provided in a building other than a dwelling, and each such compartment or bathroom forms part of a room, then each such compartment or bathroom shall be fitted with an opaque door capable of closing the door-aperture to a height of not less than two metres, except that a gap of not more than 100 millimetres may be left between the bottom of such door and the floor:

Provided that the local authority may, in its discretion, permit the omission of the door to such compartment or bathroom.

(4) Where any bedroom is provided with its own sanitary fittings, such fittings and the persons served thereby shall not be taken into account when the number of such fittings, required by Table I to be installed, is determined.

TABLE I

MINIMUM NUMBER OF SANITARY FITTINGS REQUIRED FOR BUILDINGS

Notes.—1. Except where specific requirements for different sexes are shown the number of fittings required is related to members of each sex. Where members of each sex are not known it will be accepted as 50 per cent. male and 50 per cent. female.

2. The figures shown for the number of persons for which fittings are required are to be construed as if the words "or remaining portion thereof" had been inserted after the figures.

3. The persons for which sanitary fittings are to be provided are the maximum number which may be expected to occupy the building at any one time.

4. In accordance with the provisions of subsection (5) of section 7, specially designed water-closet compartments for physically handicapped people are required to be provided in every place of assembly, unless written exemption is obtained from the local authority.

Category A—Bakeries, creameries, laundries, workshops, petrol filling stations and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls		Wash-basins	
	No. of persons	No. of water-closets	No. of persons	No. of urinals	No. of persons	No. of basins
			(males only)			
Male or Female	First 75 thereafter 76 to 400 thereafter 401 and over	1 per 15 1 per 25 1 per 50	6 and over	1 per 25	First 75 thereafter 76 to 400 thereafter 401 and over	1 per 15 1 per 25 1 per 50

Category B—Banks, laboratories, office buildings, electricity sub-stations, factories, ice plants, power plants, radio stations, telephone exchanges and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls		Wash-basins	
	No. of persons	No. of water-closets	No. of persons	No. of urinals	No. of persons	No. of basins
			(males only)			
Male or Female	First 60 thereafter 61 and over	1 per 15 1 per 30	6 and over	1 per 25	First 60 thereafter 61 and over	1 per 30 1 per 50

Category C—Hospitals, maternity and nursing homes, homes for the aged, infirmaries, mental hospitals, reformatories, sanatoria and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls		Wash-basins		Baths or showers	
	No. of persons	No. of water-closets	No. of persons	No. of urinals	No. of persons	No. of basins	No. of persons	No. of baths or showers
			(males only)					
Male or Female	First 50 thereafter 51 and over	1 per 10 1 per 15	First 6 to 30 thereafter 31 and over	1 per 15 1 per 30	First 32 thereafter 33 and over	1 per 8 1 per 15	First 30 thereafter 31 and over	1 per 15 1 per 30

Category D—Colleges and schools (non-residential), creches, nursery schools and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls		Wash-basins	
	No. of persons	No. of water-closets	No. of persons	No. of urinals	No. of persons	No. of basins
Male	First 50 thereafter 51 and over	1 per 25 1 per 50	First 6–50 thereafter 51 and over	1 per 25 1 per 50	First 50 thereafter 51 and over	1 per 50 1 per 100
Female	First 60 thereafter 61 and over	1 per 20 1 per 30	—	—	First 60 thereafter 61 and over	1 per 30 1 per 60

Category E—Bars, bowling alleys, billiard rooms, exhibition buildings, cafes, canteens, casinos, club-rooms, dance halls, dining-rooms, gymnasia, lounges, nightclubs, restaurants, skating rinks, public swimming baths, drill halls, passenger stations and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls	
	No. of persons	No. of water-closets	No. of persons	No. of urinals
Male	First 100 101 and over	1 per 100 1 per 100	First 100 101 and over	1 per 50 1 per 50
Female	First 100 101 and over	1 per 50 1 per 50	—	—

Category F—Armouries, art galleries, bath-houses, auditoria, clinics, galleries, libraries, lodgerooms, museums and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls	
	No. of persons	No. of water-closets	No. of persons	No. of urinals
Male	First 100 thereafter 101 and over	1 per 100 1 per 200	First 100 thereafter 101 and over	1 per 100 1 per 100
Female	First 100 thereafter 101 and over	1 per 50 1 per 100	—	—

Category G—Arenas, grandstands, stadia and buildings of a similar nature. (Applicable to spectators only.)

Used by	Water-closets		Urinal-stalls	
	No. of persons	No. of water-closets	No. of persons	No. of urinals
Male	First 250 thereafter 251 to 500 thereafter 501 to 1 000 thereafter 1 001 to 2 000 thereafter 2 001 and over	1 per 125 1 per 250 1 per 500 1 per 1 000 1 per 2 500	First 500 thereafter 501 to 1 000 thereafter 1 001 to 2 000 thereafter 2 001 and over	1 per 50 1 per 100 1 per 200 1 per 500
Female	First 200 thereafter 201 to 700 thereafter 701 to 1 700 thereafter 1 701 and over	1 per 40 1 per 100 1 per 250 1 per 500	—	—

The minimum number of sanitary fittings for staff and players shall be as required by the local authority.

Category H—Assembly halls, broadcasting and television studios, cinemas, concert rooms, opera houses, theatres and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls	
	No. of persons	No. of water-closets	No. of persons	No. of urinals
Male	First 100 thereafter 101 and over	1 per 50 1 per 200	First 100 thereafter 101 and over	1 per 25 1 per 50
Female	First 99 thereafter 100 and over	1 per 33 1 per 100	—	—

Categories E, F, G and H above.

Wash-basins Males		Wash-basins Females	
From 1 to 150	1	From 1 to 100	1
From 151 to 300	2	From 101 to 250	2
From 301 to 600	3	From 251 to 500	3
From 601 to 1 000	4	From 501 upwards, for every 400 add	1
From 1 001 upwards, for every 1 000 add	1		

Category I—Places of worship. A minimum of one water-closet and one wash-basin to be provided for each sex, but, if any part of a place of worship is used as a place of general public assembly, e.g. a church hall, such additional number of water-closets and wash-basins shall be provided as may be required in any particular case by the local authority.

Category J—Boarding houses, convents, dormitories, hostels, hotels, lodging houses, residential clubs, residential schools, colleges, orphanages and buildings of a similar nature.

Used by	Water-closets		Urinal-stalls		Wash-basins		Baths or showers	
	No. of persons	No. of water-closets	No. of persons	No. of urinals	No. of persons	No. of basins	No. of persons	No. of baths or showers
Male	First 36 thereafter 37 and over	1 per 12 1 per 20	First 6–30 thereafter 31 and over	1 per 15 1 per 30	First 40 thereafter 41 and over	1 per 8 1 per 15	First 24 thereafter 25 and over	1 per 8 1 per 15
Female	First 30 thereafter 31 and over	1 per 10 1 per 15	—	—	as above		as above	

Category K—Dwellings.

Water-closets	1 per unit of accommodation
Wash-basins	1 per unit of accommodation
Baths or showers	1 per unit of accommodation

(5) Unless written exemption is obtained from the local authority, every place of assembly as defined in Chapter 11, to which access is provided for physically handicapped people, shall be provided with at least one water-closet compartment for each sex for use by physically handicapped people either separately or within other toilet accommodation, and the following requirements shall be complied with in respect of each compartment—

(a) the compartment shall be accessible by lift or ramp having a slope not exceeding 1 in 12 from the place of assembly;

(b) the width of the entrance door to the compartment shall be not less than 870 millimetres and shall open outwards;

(c) the width of the compartment shall be not less than 1 350 millimetres;

(d) a firm horizontal bar shall be provided 900 millimetres from ground-level either on the wall immediately adjacent to the water-closet or as an attachment to the pan; and

(e) all handles and locking devices to doors shall be fitted 900 millimetres from gound-level.

PART II

QUALITY AND DESIGN OF SANITARY FITTINGS, PIPING, AND ACCESSORIES[1]

A. MATERIALS: SANITARY FITTINGS

GENERAL

8. (1) All sanitary fittings shall be substantially made, shall be constructed of corrosion-resistant material, shall be impermeable to water, and shall be finished with a smooth surface, free from all flaws or blemishes.

(2) All sanitary fittings may, prior to their being put into use, be tested by, and shall be subject to, the approval of the local authority.

(3) No soil-water fittings shall be encased in wood or other absorbent material.

(4) All soil-water fittings shall be of vitrified earthenware, glazed porcelain, fire-clay or vitreous china, all having a glazed finish, or shall be of any approved impervious material.

(5) All waste-water fittings shall be of the materials specified in subsection (4) or of cast iron, enamelled mild steel or stainless alloy.

(6) The provisions of this section shall not apply to sanitary fittings already installed at the date on which it comes into operation unless such fittings are in, at the said date, or thereafter have fallen into, such a condition that their continued use constitutes or is likely to constitute a nuisance or a health hazard.

WATER-CLOSET BOWLS

9. (1) Water-closet bowls and associated traps, if made of ceramic material, shall comply with S.A.B.S. 497, Glazed ceramic sanitaryware.

(2) Any pad inserted between the base of the bowl and the floor shall be of non-absorbent material.

(3) Non-absorbent seat-rims or hinged seats shall be fitted to such bowls except in the case of squat pans.

FLUSHING-CISTERNS

10. (1) Every water-closet, urinal or slop-hopper shall be flushed by means of an approved flushing-valve or a flushing-cistern complying with S.A.B.S. 497, or with S.A.B.S. 821, W.C. flushing cisterns.

(2) When coupled to a wash-down pan, the cistern shall have the following maximum flushing-times—

High-level cistern	*Low-level cistern*
9,1 litres: 6 seconds	9,1 litres: 7 seconds
11,4 litres: 7,5 seconds	11,4 litres: 8,5 seconds
13,6 litres: 8,5 seconds	13,6 litres: 10 seconds

(3) Such cisterns, other than the automatic-discharge type, shall be fitted with an approved water-waste preventer-valve or siphon and with a ball-valve complying with S.A.B.S. 752, Ballvalves.

(4) The overflow pipe shall terminate in a position, to the approval of the local authority, where an overflow can be readily noticed and will not result in damage to the building.

FLUSHING-VALVES

11. (1) Where flushing-valves are used, they shall deliver, automatically, a volume of water not less than, and at a rate not less than, that prescribed for flushing-cisterns.

(2) Adequate measures shall be taken to prevent back-siphonage from the soil-water fittings into the water-supply, which measures may consist of either a completely separate tank of sufficient capacity and height to secure satisfactory operation or an anti-siphonage device integral with the valve approved by the local authority.

SLOP-HOPPERS

12. (1) All slop-hoppers shall be fitted with approved hinged corrosion-resistant metal gratings having openings not exceeding 20 millimetres in width.

(2) The water-line shall be just below such grating, and the area of the surface of the water shall be not less than the area of the spigot outlet of the fitting.

(3) A second movable grating for the support of receptacles shall be used above the other, and shall have openings not less than 75 millimetres in width.

(4) Slop-hoppers shall not be constructed in two pieces unless the junction is above the water-line of the trap and the joint is constructed to render it firm and watertight.

URINALS

13. (1) Where urinals are manufactured from fire-clay or stainless steel, they shall comply with S.A.B.S. 497, Glazed ceramic sanitaryware or S.A.B.S. 924, Stainless steel stall urinals, respectively.

(2) The bottom of the urinal shall be evenly graded to an outlet trap of an internal diameter of not less than 75 millimetres, and shall be provided with an efficient corrosion-resistant hinged domical metal grating of such size as to be capable of rapidly and efficiently clearing the contents of the urinal, including the flush discharge.

(3) Where urinals are not separated into single units, each 500 millimetres of length of such urinal shall be taken as being equivalent to a urinal unit.

(4) Where basin urinals are used they shall—

(a) be trapped at the outlet of the fitting and the outlet pipe shall be carried from the trap at a suitable fall to discharge into a soil stack or private sewer; or

(b) discharge through vertical outlet pipes, without the interposition of a trap into a glazed floor channel leading to a trap.

(5) Where urinal stalls are in ranges, or where they are not separated into single units, the invert of

[1] Note that, in terms of Chapter 2, permission for the use of materials or things not specifically permitted or prescribed in this Part of these by-laws, or, indeed, in any other Part of these by-laws, may be obtained in the manner set out in the said Chapter.

the channel or of the urinal range may be evenly graded to a common outlet trap complete with hinged grating as for single-stall urinals, but, in such cases, the outlet trap shall be not less than 100 millimetres in internal diameter.

(6) Where conditions prevent the lip of a urinal stall or channel from finishing flush with the floor, the urinal shall be provided with a step of a height and width approved by the local authority.

(7) Where required by the local authority, a separate trap shall be provided for each stall.

GRATINGS

14. Approved gratings shall be fitted to all outlets from waste-water fittings, and all such gratings shall be of such size and so constructed as to ensure ample outlet space for the rapid and efficient discharge of the water or other liquid contained in such fittings.

SANITARY FITTINGS HAVING PLUGS OR STOPPERS

15. Sanitary fittings having plugs or stoppers shall comply with the requirements of S.A.B.S. 497, and shall be so constructed that water cannot remain in the overflow when the fitting is empty.

PROHIBITED SANITARY FITTINGS

16. No sanitary fitting and no other device of any kind whatsoever shall be installed nor shall any type of construction be resorted to which will, or will be likely to, provide any cross-connexion between a water-distribution system and any part of a plumbing system of such a nature as to render possible backflow or siphonage from such sanitary fitting or other device into such water-distribution system.

B. MATERIALS: PIPES, TRAPS AND ASSOCIATED FITTINGS

GENERAL

17. (1) All pipes, traps and associated fittings shall be free from defects, and shall comply with the requirements of this section.

(2) All drain-pipes, sewer-pipes, soil-pipes, bends, junctions and associated fittings shall be of glazed earthenware, asbestos-cement, U.P.V.C., concrete, pitch-impregnated fibre, cast iron or other approved material.

(3) All waste-pipes and vent-pipes shall be of cast iron, galvanized steel, drawn lead, copper, brass, asbestos-cement, U.P.V.C. or other approved material.

(4) Where U.P.V.C. pipes are used in any building exceeding two storeys, such pipes shall not be exposed to direct sunlight.

(5) All pipes, traps and associated fittings shall be of the same material in any one sewerage system or plumbing system, and specifically designed for the purpose of their use:

Provided that a change from one material to another may be made with fittings made specifically for that purpose.

(6) All traps shall be of glazed earthenware, porcelain, vitreous china, lead, brass, copper, cast iron, galvanized mild steel or stainless alloy or other approved material, or shall be porcelain-enamelled inside.

(7) All traps shall have smooth interior waterways of full-sized bore and, except in the case of resealing traps, their nominal inside diameter shall be not less than the outlet diameter of the sanitary fittings or the sewer pipes to which they are connected.

STRAP HANGERS AND RING HANGERS

18. Strap hangers and ring hangers used in accordance with section 66 shall be of—

(a) corrosion-resistant metal; and

(b) heavy pattern;

and shall be securely attached to the building construction.

SOIL-PIPES, WASTE-PIPES AND VENT-PIPES AND ASSOCIATED FITTINGS

19. (1) Soil-pipes, waste-pipes and vent-pipes and fittings of cast iron, copper, asbestos-cement or unplasticized polyvinyl chloride (U.P.V.C.) shall comply with the relevant standard specifications as follows—

(a)	S.A.B.S. 460	Copper and copper alloy tubing;
(b)	S.A.B.S. 721	Asbestos cement soil, waste, and ventilating pipes and fittings;
(c)	S.A.B.S. 746	Cast iron soil, waste water, and ventilating pipes and fittings;
(d)	C.A.S. No. K32	Unplasticized polyvinyl chloride (U.P.V.C.) soil, waste, and vent-pipes and fittings.

(2) Soil-pipes, waste-pipes, vent-pipes and associated fittings of galvanized steel, lead or copper shall conform to the requirements of Table II.

TABLE II

THICKNESSES AND MASSES OF GALVANIZED STEEL, LEAD AND COPPER SOIL-PIPES, WASTE-PIPES AND VENT-PIPES

1	2	3	4	5
Nominal size, millimetres	Galvanized steel		Lead	Copper
	Minimum thickness, millimetres	Minimum mass, kilograms per metre	Minimum mass, kilograms per metre	Minimum thickness, millimetres
32	3,25	3,14	4,46	1,22
40	3,25	3,61	5,46	1,22
50	3,65	5,1	5,95	1,22
65	3,65	6,51	7,44	1,22
80	4,05	8,47	8,93	1,42
90	4,05	9,72	12,90	1,42
100	4,5	12,1	13,88	1,63
125	4,85	16,2	23,81	—
150	4,85	19,2	29,76	—

(3) All installations of unplasticized polyvinyl chloride pipes shall comply with S.A.B.S. 0112.

SEWER-PIPES AND DRAIN-PIPES AND ASSOCIATED FITTINGS OF MATERIALS OTHER THAN CAST IRON

20. (1) All sewer-pipes and drain-pipes and fittings of glazed earthenware, asbestos-cement, pitch-impregnated fibre, concrete or U.P.V.C. shall comply with the relevant standard specifications as follows—

(a) C.A.S. No. A16 Earthenware drain and sewer pipes and fittings;

(b) S.A.B.S. 676 Reinforced concrete pressure pipes;

(c) C.A.S. No. A17 Concrete pipes (non-pressure);

(d) S.A.B.S. 819 Asbestos cement sewer-pipes;

(e) S.A.B.S. 921 Pitch-impregnated fibre pipes and couplings;

(f) C.A.S. No. K28 Unplasticized polyvinyl chloride (U.P.V.C.) sewer and drain pipes and fittings.

(2) All installations of unplasticized polyvinyl chloride pipes shall comply with S.A.B.S. 0112.

CAST IRON SEWER-PIPES, TRAPS AND ASSOCIATED FITTINGS

21. (1) All cast iron sewer-pipes, traps and associated fittings shall be sound, neatly dressed castings which are dark grey on fracture and capable of being easily drilled, tapped and filed.

(2) The pipes shall be true, smooth, cylindrical and straight, and their inner and outer surfaces shall be as nearly as practicable concentric.

(3) The pipes shall ring clearly when tested for soundness by being struck all over with a light hand hammer.

(4) All such pipes, traps and associated fittings shall be effectively protected against corrosion by being coated on both the inside and the outside with a suitable corrosion-resistant bitumen, tar or other approved compound.

(5) The thickness of such pipes, traps and associated fittings, and the mass, internal depth of socket and caulking space of pipes, shall be as set out in Table III.

TAPERED PIPES

22. (1) Tapered pipes complying with the requirements of C.A.S. No. A16 shall be used when directly increasing the size of an earthenware sewer.

(2) The diameter of the ends of such tapered pipes shall correspond to the diameter of the pipes to which they are connected, and the gradient of such larger pipe shall not be decreased unless the soffit of the taper pipe is in line with that of the smaller pipe and on the same gradient.

GREASE-TRAPS

23. Grease-traps, if of earthenware, shall comply with C.A.S. No. A16.

TABLE III

DIAMETERS, THICKNESSES, MASSES, INTERNAL DEPTHS OF SOCKETS AND CAULKING SPACES OF CAST IRON SEWER-PIPES, TRAPS AND ASSOCIATED FITTINGS

1	2	3	4	5
Internal diameter, millimetres	Minimum thickness, millimetres	Minimum mass of pipes (including socket and beaded spigot or flanges), kilograms per metre	Minimum internal depth of socket of pipes, millimetres	Minimum clear caulking space with pipes in position, millimetres
100	9,5	25,95	76,2	7,9
150	9,5	37,21	88,9	9,5
200	11,9	61,18	101,6	9,5
225	12,7	72,92	101,6	9,5

TRAPPED GULLIES

24. Trapped gullies, if of earthenware, shall comply with C.A.S. No. A16, and shall be covered with an approved grating, the bars of which shall be not more than 10 millimetres apart.

RESEALING-TRAPS

25. All resealing-traps shall be of a type approved by the local authority.

PROHIBITED FITTINGS

26. (1) No single- or double-tee or tapped-tee branch or any fitting or connexion which offers abnormal obstruction to flow through a sewer-pipe, waste-pipe or soil-pipe shall be used.

(2) The drilling and tapping of any pipe used in the sewerage system after its installation is prohibited.

(3) Dead ends in waste-pipes or soil-pipes shall not be permitted except where necessary to extend the pipe for cleaning purposes, and all such dead ends shall be accessible.

(4) No opposite junction shall be used in any sewerage system if the included angle between the two entering pipes will exceed 90 degrees.

(5) Loose sockets shall be used only where no other form of construction is practicable, and then only with the approval of the local authority.

THREADED FITTINGS

27. All threaded fittings shall be of copper, brass, malleable cast iron or galvanized mild steel, and shall be of recessed pattern with smooth interior waterways and with threads tapped out of solid material.

SEALS IN FITTING-TRAPS

28. (1) Except in the case of resealing-traps, the maximum depth of water-seal in all fitting-traps shall be 100 millimetres.

(2) For two-pipe system installations, the minimum depth of water-seal in all fitting-traps shall be 40 millimetres for waste-water fittings and 50 millimetres for soil-water fittings.

(3) For one-pipe systems and single-stack systems, the minimum depth of water-seal shall be 75 millimetres for waste-water fittings, and 50 millimetres for soil-water fittings.

(4) Every trap of which the seal is not readily accessible shall be provided with a removable cleaning-eye of sufficient size protected by the water-seal, and every trap shall be self-cleansing.

(5) Traps which depend for their seal upon movable parts or inaccessible interior partitions shall not be used:

Provided that grease-traps may have integrally cast partitions of corrosion-resistant material.

WASTE OVERFLOW

29. Where any sanitary fitting is provided with an overflow, such overflow shall, except in the case of cisterns and storage-tanks, be connected close to its fitting above the water-seal of the latter, and shall discharge either into the open air or to the inlet of the associated trap, and shall be so arranged that it is readily accessible for cleaning.

JOINTING

30. Jointing of sewers and fittings shall be made—

(a) with materials approved for use with the particular material of which the sewers and fittings are made; and

(b) in such a manner as—

(i) to prevent leakage from the joint; and

(ii) where necessary, to allow some movement of the joint.

ASPHALTIC COMPOUND

31. Asphaltic compound used for joints shall not—

(a) be brittle at normal temperature; nor

(b) soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 70°C; nor

(c) be soluble in any of the wastes carried by the sewerage system.

SOLDER

32. Solder used for plumbing shall comply with with the requirements of C.A.S. No. H3, Soft solders.

C. DISCHARGE CAPACITIES AND SIZES OF PIPES AND SEWERS

DISCHARGE UNITS

33. (1) For the purposes of this section, the rate at which sewage is discharged into, or at which it flows through, a pipe or sewer shall be measured in units which are herein referred to as "discharge units" (abbreviated reference d.u.).

(2) The rate at which sewage flows through a pipe or sewer at a particular point therein shall be the sum of the rates at which such sewage is discharged into such pipe or sewer in accordance with section 34 at all points above that particular point.

RATES OF DISCHARGE FROM SANITARY FITTINGS

34. Any sanitary fitting with an outlet of a diameter referred to in column 1 of Table IV shall be deemed to discharge sewage at the rate stated for such sanitary fitting in column 2 or column 3 of such Table, whichever is applicable.

TABLE IV

RATES OF DISCHARGE FROM SANITARY FITTINGS

1	2	3
Diameter of sanitary fitting outlet, millimetres	Rate of discharge in discharge units (d.u.)	
	Sanitary fitting installed in a dwelling	Sanitary fitting installed in a building other than a dwelling
32	1	1
40	1	2
50	1½	3
65	2	4
75	2½ (1½*)	5 (3*)
100	3	6

* For a urinal or a group of urinals with a common trap.

TABLE V

MAXIMUM DISCHARGE CAPACITY FOR SEWERS AND FOR HORIZONTAL PIPES

1	2	3	4	5	6
Diameter of pipe or combined private sewer or private sewer, millimetres	Horizontal pipe, discharge capacity, d.u.	Discharge capacity for sewers with a gradient of			
		1:200 d.u.	1:100 d.u.	1:50 d.u.	1:25 d.u.
32	1	—	—	—	—
40	3	—	—	—	—
50	6	—	—	21	26
65	12	—	—	24	31
75	32	—	36	42	50
100	160	—	180	216	250
125	360	—	390	480	575
150	620	—	700	840	1 000
200	1 400	1 400	1 600	1 920	2 300
250	2 500	2 500	2 900	3 500	4 200
300	3 900	3 900	4 600	5 600	6 700
375	7 000	7 000	8 300	10 000	12 000

DISTINCTION BETWEEN HORIZONTAL AND VERTICAL PIPES

35. For the purposes of the provisions of this Chapter, any pipe which is inclined to the horizontal at an angle of less than 45 degrees shall be deemed to be a horizontal pipe, and any other pipe shall be deemed to be a vertical pipe.

CAPACITIES OF HORIZONTAL PIPES

36. Every horizontal pipe or sewer having a diameter set out in column 1 of Table V shall be deemed to have a maximum discharge capacity set out in column 2 for such pipe and set out in columns 3, 4, 5 and 6 for such sewer, and the aggregate rate of discharge of all the sanitary fittings discharging into any such pipe or private sewer shall not exceed such maximum discharge capacity.

CAPACITIES OF VERTICAL PIPES

37. Every vertical pipe shall be of such a diameter that—

(a) the rate at which sewage flows through such pipe at any point does not exceed the rate shown for the pipe of that diameter in column 2 or column 3 of Table VI, whichever is applicable; and

(b) the rate at which sewage enters such pipe at any point (if the wetted portion of such pipe exceeds two storeys in height above ground-floor level) does not exceed the rate shown for the pipe in column 4 of Table VI:

Provided that, wherever sewage enters any such pipe at two or more consecutive points, neither or none of which is more than 2,4 metres from any other, all the sewage entering the pipe at such two or more consecutive points, shall for the purpose of this paragraph, be deemed to enter such pipe at the lower or lowest of such two or more consecutive points, as the case may be.

MINIMUM SIZE OF PIPES, ETC.

38. Subject to the provisions of sections 36 and 37, no soil-pipe, private sewer or waste-sewer shall be less than 100 millimetres in diameter:

Provided that a waste-sewer not exceeding 4,6 metres in length or a soil-pipe serving urinals or bidets may be less than 100 millimetres but not less than 50 millimetres in diameter.

PART III

CONSTRUCTION AND FIXING OF SOIL-PIPES AND WASTE-PIPES AND FITTINGS

A. VENTILATION AND ANTI-SIPHONAGE

VENTS: GENERAL

39. (1) Every soil-pipe, waste-sewer and sewer, including every branch thereof which exceeds six metres in length, measured from its junction with a ventilated private sewer or a ventilated soil-pipe to its point of connexion with the soil-fitting which it serves, shall be provided with a ventilation-pipe leading upwards from its highest convenient point.

(2) Every waste-pipe and branch waste-pipe which exceeds six metres in length, measured from its point of discharge over a gully or from its junction with a ventilated waste-pipe or ventilated soil-pipe, as the case may be, to its point of connexion with the waste-water fitting which it serves shall be provided with a ventilation-pipe leading upwards from its highest convenient point.

(3) Subject to the provisions of anything to the contrary contained in this Chapter, there shall be at least one 100-millimetre-diameter vent for every private sewer:

Provided that, with the prior approval of the local authority, this vent may be omitted on a sewer of less than six metres in length which receives the discharge from a single soil-water fitting and not more than two waste-water fittings.

TABLE VI

CAPACITIES OF VERTICAL PIPES

1	2	3	4
Diameter of pipe, millimetres	Maximum rate of flow, d.u.		Maximum rate of entry (in d.u.) into pipe at any point, if wetted portion of pipe exceeds two storeys in height above ground-floor level
	Where wetted portion of pipe does not exceed two storeys in height above ground-floor level	Where wetted portion of pipe exceeds two storeys in height above ground-floor level	
32	2	2	1
40	4	8	2
50	10	24	6
65	20	42	9
75	30	60	16
100	240	500	90
125	540	1 100	200
150	960	1 900	350
200	2 200	3 600	600
250	3 800	5 600	1 000
300	6 000	8 400	1 500

(4) The diameter of a vent and of an anti-siphon pipe shall be determined from its length and from the total of discharge units connected thereto as provided in Table VII:

Provided that no vent serving a soil-fitting shall have a diameter less than 50 millimetres.

TABLE VII

DIAMETER AND LENGTH OF VENTS

1	2	3	4	5	6	7	8	9	10	11	12	13
Size of stack, millimetres	Total d.u. connected to stack	Diameter of vent, millimetres										
		32	40	50	65	75	100	125	150	200	250	300
		Maximum length of vent, metres										
32	2	9										
40	8	15	45									
40	10	9	30									
50	12	9	23	60								
50	20	8	15	45								
65	42		9	30	91							
75	10		13	44	108	317						
75	21		9,5	33	82	245						
75	53		8	29	70	207						
75	102		7,5	26	64	189						
100	43			10,5	26	76	297					
100	140			8	20	59	229					
100	320			7	17	50	194					
100	530			6,5	15	46	177					
125	190				8,5	25	98	300				
125	490				6,5	19	75	232				
125	940				5,5	16	63	204				
125	1,400				5	15	58	178				
150	500					10	40	122	305			
150	1 100					8	30	94	236			
150	2 000					7	26	79	200			
150	2 900					6	23	73	181			
200	1 800						9,5	29	73	287		
200	3 400						7,5	22	56	220		
200	5 600						6	19	47	186		
200	7 600						5,5	17	43	169		
250	4 000							9,5	24	93	293	
250	7 200							7,5	18	72	224	
250	11 000							6	15,5	61	191	
250	15 000							5,5	14	55	174	
300	7 300								9,5	37	116	287
300	13 000								7,5	28,5	90	220
300	20 000								6	24	76	186
300	26 000								5,5	22	69	169

TABLE VII—*continued*

1	2	3	4	5	6	7	8	9	10	11	12	13
Size of stack, millimetres	Total d.u. connected to stack	Diameter of vent, millimetres										
		32	40	50	65	75	100	125	150	200	250	300
		Maximum length of vent, metres										
375	15 000									12	38	93
375	25 000									9,5	29	72
375	38 000									8	25	61
375	50 000									7,5	22,5	55

VENTILATION OUTLETS

40. (1) Every vent-pipe or anti-siphon pipe shall be carried upwards without diminution of diameter to a height of at least 4,5 metres above finished ground-level, 300 millimetres above place of emergence through the roof, or 1 metre above eaves-level, whichever is the greatest height, or to such greater height or to such position as the local authority may require, having regard to the amenity of adjoining property.

(2) The open end of any vent passing through, or attached to, a building shall be not less than 2 metres above the head of any window, door or other opening in that building or in any other building which is within a horizontal distance of 6 metres of the said open end:

Provided that, where access to the upper surface of the roof or any part thereof is provided for any purpose other than that of maintenance or repair, the pipe shall, unless the local authority otherwise permits, extend at least 2,5 metres above such roof or part thereof.

(3) Where any new building or any addition to an existing building has any windows, doors or other openings so placed that the provisions of subsection (2) are contravened in respect of an existing vent, whether on the same or any other property, the owner of such new building or addition shall, at his own expense, do all such things as may be necessary to bring such existing vent into compliance with the said subsection.

(4) No chimney or other flue shall be used for ventilating any sewer-pipe, soil-pipe or waste-pipe.

(5) The open end of every vent shall be surmounted by an approved wire cage grating having apertures of an aggregate area not less than the sectional area of the pipe.

GRADIENT OF VENTS AND ANTI-SIPHON PIPES

41. Every vent and every anti-siphon pipe shall be so graded as to provide a continuous fall without the interposition of a trap from its open end to the point of connexion to the waste-pipe, soil-pipe, private sewer or combined private sewer which it serves.

BRANCH VENTS AND ANTI-SIPHON PIPES

42. Every vent and every anti-siphon pipe shall, unless carried up independently, be connected to a main vent at a point at least 150 millimetres above the top of the highest fitting which the main vent serves.

INTERCONNEXION OF VENTS FROM SOIL- AND WASTE-FITTINGS

43. Where the two-pipe system is used, a pipe which ventilates a soil-pipe or fitting and a pipe which ventilates a waste-pipe or fitting shall not be connected to each other.

ANTI-SIPHON PIPES

44. (1) Every individual anti-siphon pipe shall be connected to the soil-pipe or waste-pipe which it serves on the outlet side of the trap obliquely in the direction of flow of the last-mentioned pipe at a point not less than 75 millimetres or more than 750 millimetres from the crown of the trap.

(2) Such anti-siphon pipe shall be carried up independently to discharge into the open air in accordance with the requirements of subsection (1) of section 40, or such anti-siphon pipe shall be connected to a common anti-siphon pipe at a point not less than 150 millimetres above the top of the fitting which such anti-siphon pipe serves.

(3) The common anti-siphon pipe either shall discharge into the open air in accordance with the requirements of subsection (1) of section 40, or it may be connected to the main vent in accordance with the requirements of section 42.

PROTECTION OF SOIL-WATER TRAPS

45. Subject to the provisions of section 46, the water-seal of the trap of a soil-water fitting shall, in the following cases, be protected by means of an anti-siphon pipe of such dimensions and location as are prescribed in section 39 and in subsection (1) of section 40, respectively, that is to say where such soil-water fitting—

(a) discharges into an unventilated sewer or soil-pipe or a combination thereof in which there is a fall of more than 1,2 metres within a horizontal distance of 2,4 metres from the crown of the trap; or

(b) discharges into a ventilated soil-pipe or private sewer having an inclination from the horizontal of 45 degrees or greater, and which receives the discharge from one or more other soil-water fittings at a higher level, except as provided for in section 48; or

(c) not being the soil-water fitting situated at the uppermost or remotest end of the soil-pipe or sewer, discharges into an unventilated soil-pipe or sewer which receives the discharge from any other soil-water fitting.

VENTILATION OF SOIL-WATER FITTINGS

46. Where several soil-water fittings are connected to a branch soil-pipe which is provided with a vent connected to such branch soil-pipe immediately short of the farthest soil-water fitting on such branch, and such vent is connected to another vent at a point not less than 150 millimetres above the highest water-level possible in any such soil-water fitting, anti-siphon pipes may be omitted.

PROTECTION OF WASTE-WATER TRAPS

47. (1) In the one-pipe system, the water-seal of the trap of every waste-water fitting shall be protected by means of an anti-siphon pipe:

Provided that, where horizontal waste-pipes are back-vented as described in section 46, the anti-siphon pipes may be omitted.

(2) In the two-pipe system, the water-seal of the trap of every waste-water fitting shall be protected by means of an anti-siphon pipe or a back-vent unless an approved resealing-trap is installed:

Provided that this subsection shall not apply in the case of a single bath, shower or sink having an independent discharge to a gully, and where the total length of the waste-pipe does not exceed six metres.

SINGLE-STACK SYSTEMS

48. (1) Single-stack systems may be used under the following conditions—

(a) all soil and waste branch pipes shall be separately connected to the vertical soil stack;

(b) the minimum depth of water-seals shall be 75 millimetres for waste-water fittings, and 50 millimetres for soil-water fittings;

(c) the waste-pipe used in conjunction with a 32-millimetre-diameter trap from a lavatory basin shall have a minimum diameter of 40 millimetres, a maximum fall of 1 in 25, and a maximum length of 3 metres;

(d) the minimum size of waste-pipe from bath or sink fittings shall be 40 millimetres in diameter;

(e) no horizontal waste-pipe shall be connected to the vertical soil stack so that its centre line is on a level with, or within 200 millimetres below, the centre line on a soil branch;

(f) a large radius bend of at least two one-eighth bends shall be installed at the foot of the vertical soil stack;

(g) the minimum vertical distance between the lowest branch connexion and the invert of the sewer shall be 500 millimetres for buildings up to three storeys, and 750 millimetres for other buildings;

(h) no offsets in vertical stacks below the topmost fitting shall be permitted unless venting is provided to relieve any back pressure.

(2) The rate of flow in the vertical soil stack of a single-stack system as calculated in terms of sections 33 and 34 shall not, at any point, exceed the rate given in column 2 of Table VIII for the corresponding size of vertical pipe indicated in column 1.

(3) Alternatively to subsection (2), the rate in a 100-millimetre-diameter vertical pipe may exceed 70 d.u. but shall in no instance exceed 280 d.u., and in such cases, a continuous 50-millimetre-diameter vent-pipe shall be provided and connected to the vertical pipe at each floor level, either directly or to the anti-siphon horn adjacent to a 100-millimetre soil-water fitting.

TABLE VIII

Maximum rates of flow in vertical soil stacks in single-stack system.

1	2
Diameter of pipe, millimetres	Maximum rate of flow, d.u.
75	14
100	70
150	350

B. TRAPS AND GULLIES

TRAPS IN WASTE-WATER FITTINGS

49. (1) Except as permitted in subsection (4), there shall be provided immediately beneath every waste-water fitting an approved trap having a removable cleaning-plug or other approved means of cleaning situated below the water-seal.

(2) The nominal bore of such a trap shall be not less than—

(a) the size of the waste-water fitting outlet to which it is attached; or

(b) 32 millimetres in the case of a wash-hand basin and 40 millimetres in the case of a sink or a bath;

whichever is the greater.

(3) The depth of the water-seal in a trap serving a waste-water fitting shall in no case exceed 100 millimetres, and shall be not less than 40 millimetres in a two-pipe system and not less than 75 millimetres in a one-pipe system or single-stack system.

(4) Notwithstanding the provisions of subsection (1)—

(a) a bath, a shower, a wash-hand basin or a sink used only for laundry purposes may discharge without the interposition of a trap into an open channel which—

(i) is semicircular in cross-section and has a diameter of at least 100 millimetres and is made of glazed ceramic material or other approved material; and

(ii) is accessible for cleaning throughout its length and is placed immediately beneath the point or points of discharge; and

(iii) discharges into a trap capable of receiving the discharge and having a corrosion-resistant metal grating;

(b) a bath, a shower or a wash-hand basin installed in a compartment containing a urinal or squat pan may, with the prior written approval of the local authority, discharge into the urinal channel, or squat pan, if the outlet from any such bath, wash-hand basin or shower is above the highest part of the urinal channel or squat pan;

(c) a range of wash-hand basins or sinks may discharge into a common waste-pipe without the interposition of traps:

Provided that such common waste-pipe does not exceed two metres in length, has a diameter of at least 50 millimetres and is provided with a trap as described in subsection (3) beneath the final fitting.

TRAPS IN SOIL-WATER FITTINGS

50. Except as is provided for urinals in section 13, every soil-water fitting shall be provided with an approved trap, built integrally with the fitting, but such trap may, with the approval of the local authority, be joined to the fitting if the junction is above the water-line of the trap and the joint is firm and water-tight.

WASTE WATER TO DISCHARGE INTO TRAPPED GULLY

51. (1) Except in the case of a one-pipe system and a single-stack system, all waste water shall discharge into a trapped gully or grease-trap below the grating thereof and above the level of the water therein, which shall be connected to a sewer.

(2) No waste-pipe shall discharge into or connect with a gutter, hopper-head or pipe provided or used for the conveyance of rain-water or into a channel provided for the irrigation of a garden.

INLETS TO SEWERS TO BE TRAPPED

52. (1) Trapped gullies shall be so formed and installed as to maintain a water-seal of 60 millimetres, and no other trap shall be placed between a trapped gully and the public sewer.

(2) Gully-traps and grease-traps shall be provided with hopper-heads with side and vertical inlets to receive waste-pipes.

(3) A hopper-head shall be encased in cement concrete at least 75 millimetres thick, which shall be carried to a height of at least 150 millimetres above the surrounding ground-level.

GREASE-TRAPS

53. Where required by the local authority, grease-traps of a size approved by the local authority shall be fitted to take the discharge from every scullery or kitchen sink, and, if they are constructed of earthenware, shall comply with the provisions of section 23, but, in any case, grease-traps shall be placed as near as possible to the fitting from which they receive the discharge.

TRAPPED DISH-GULLIES

54. (1) In respect of each dwelling-house, there shall be provided not less than one trapped dish-gully.

(2) Such gully shall be set on a base of concrete not less than 150 millimetres thick and having a composition not inferior to 50 kilograms of cement to 65 cubic decimetres of fine aggregate to 130 cubic decimetres of coarse aggregate, Grade 20.

(3) All such gullies shall be encased in similar concrete to a thickness of not less than 100 millimetres, and dishing of internal dimensions not less than 400 millimetres by 450 millimetres or more than 900 millimetres by 600 millimetres shall be provided, which dish shall be at least 75 millimetres above ground-level and finished off smooth, and shall have a fall of at least 75 millimetres to the centre of the gully, and shall be surmounted with a kerb at least 75 millimetres high and 75 millimetres wide.

(4) Except where otherwise permitted by the local authority, the maximum distance from the ground-level to the top of the water-seal in all gullies shall not exceed 450 millimetres.

SEAL PRESERVATION OF TRAPS

55. A water-tap shall be placed over every trapped gully which is connected to a sewer and which does not receive the discharge from a waste-water fitting.

INTERMEDIATE TRAPS IN SEWERS

56. No trap other than the trap required to serve a soil-water fitting directly shall be permitted between such fitting and any sewer with which it is connected.

LOCATION OF GULLIES, GREASE-TRAPS AND STABLE-TRAPS

57. (1) Subject to the provisions of subsection (3), all gullies, grease-traps and stable-traps shall be located in the open air or, if beneath a roof, in a place permanently exposed to the open air, and shall be at all times readily accessible for the purposes of cleaning or maintenance.

(2) Every floor in a factory, stable or other premises upon which liquid is discharged continuously or intermittently shall have a hard, smooth, durable surface, and shall be graded and drained to a gully or other approved trapped receptacle.

(3) Notwithstanding the provisions of subsection (1), a gully referred to in subsection (2) may be located within a building.

SILT-TRAPS AND CATCH-BASINS

58. Silt-traps and catch-basins, when installed, shall be designed so as to retain effectively the silt or any other material which may cause clogging of the sewer or drain, and shall be placed so as to be readily accessible for clearing.

C. ACCESS

ACCESS GENERALLY

59. Means of access, such as access-eyes, for cleaning and inspection shall be provided—

(a) at the foot of each waste-stack or soil-stack; and

(b) at each change of direction or gradient of waste-pipes and soil-pipes; and

(c) at every junction of waste-pipes and soil-pipes; and

(d) in such other positions as shall make all waste-pipes and soil-pipes and sanitary fittings accessible.

ACCESS TO PIPES AND CONNEXIONS

60. (1) All means of access to pipes and connexions shall be readily accessible so as to enable the plumbing system to be effectively cleansed.

(2) Any part of the plumbing system which might be exposed to possible damage shall be adequately protected.

ACCESS TO, AND REPLACEMENT OF, CISTERNS AND TANKS IN ROOF STRUCTURES AND ENCLOSED POSITIONS

61. Every cistern or tank situated within a roof structure or in any other enclosed position shall be so installed as to be readily accessible for purposes of maintenance or replacement of such cistern or tank.

D. GENERAL

POSITION AND ACCESSIBILITY OF SOIL-PIPES

62. (1) If soil-pipes and soil-ventilation pipes are placed inside a building within ducts, such ducts shall be provided with approved access.

(2) No soil-pipe or soil-ventilation pipe shall be placed inside a kitchen, pantry, shop or business premises where food is, or is proposed to be, stored, prepared or sold unless, at the sole discretion of the local authority, such soil-pipe is enclosed in an impervious duct, in which case access to such duct shall be obtainable only from outside the room or apartment.

(3) If soil-pipes, waste-pipes, ventilation-pipes or other pipes are placed in a building within totally enclosed shafts, such shafts shall be of an approved area, and shall have adequate means of access from each floor.

(4) Where necessary, an internal platform or floor, to the approval of the local authority, shall be provided at every floor-level.

(5) A cat-ladder or approved access-way shall be installed internally throughout the whole length of the shaft if so required by the local authority.

(6) The thickness of the wall of the shaft to which the pipes are fixed shall be to the approval of the local authority.

MINIMUM DROP TO FITTINGS

63. Where a waste-pipe, soil-pipe or private sewer serves two or more sanitary fittings, there shall be a drop of at least 150 millimetres from every such fitting, measured from the invert of the trap outlet to the invert of such waste-pipe, soil-pipe or private sewer.

IMPERVIOUS FLOORS

64. (1) Every soil-water fitting and every bath shall be placed on an impervious floor.

(2) Every shower-fitting shall be placed over a bath or over an impervious floor graded to a waste-water outlet connected through a trap fitted with a grating to the sewer.

ELECTROLYTIC ACTION

65. There shall be no connexion between metal pipes and cisterns or tanks of dissimilar metal where, in the opinion of the local authority, such association of dissimilar metals might set up electrolytic action.

SUPPORT OF PIPING AND FITTINGS

66. (1) Strap hangers may be used for all pipes of nominal bore up to 50 millimetres, but ring hangers shall be used for all pipes of greater size.

(2) All pipes, except those laid in the ground, shall be securely fixed at frequent intervals to that portion of the wall or other rigid portion of the structure along which they pass, to preclude sagging.

(3) Watertight joints to walls or floors shall be made where pipes or fittings pass through such walls or floors or are fixed thereto.

(4) The connexion of pipe-supports to masonry, brickwork, stone or concrete backing shall be made without the use of wooden plugs.

PART IV

CONSTRUCTION AND LAYING OF PRIVATE AND COMBINED PRIVATE SEWERS

SIZE, FALL, LINE AND CHANGES IN DIRECTION

67. (1) All sewers shall be of a size capable of taking the discharge into them, calculated in accordance with the relevant provisions of this Chapter, with a minimum internal diameter of 100 millimetres.

(2) Sewers of 100-millimetre and 150-millimetre diameter shall be laid with gradients lying between a maximum of 1 in 10 and a minimum of 1 in 60:

Provided that the local authority may, in its discretion, allow the maximum gradient to be increased or the minimum gradient to be decreased in particular circumstances, taking into account available falls, types of pipes and joints used, and the flow anticipated in the pipes.

(3) All sewers shall be laid in true alignment and at uniform gradients, and shall be so supported or so anchored as to maintain these gradients.

(4) All spigot-and-socket sewer pipes shall be laid with the spigot-ends pointing in the direction of the flow.

(5) All sewers shall be laid so that the barrel of the pipe is fully supported and evenly bedded on the bottom of the trench or on any special bed provided.

(6) The backfilling to all sewers shall be carried out by carefully placing and consolidating sand or selected fine granulated soil evenly around the pipe on both sides, and on top of the pipe to a height of 150 millimetres above the crown of the pipe, and thereafter backfilling and consolidating the remainder of the trench up to the final level.

(7) Changes in the horizontal direction of sewers shall be made with bends of approved materials, which shall have radii not less than those specified in C.A.S. No. A16 for earthenware bends.

(8) When the change of direction of flow does not exceed 90 degrees, the radius of the complete bend shall be not less than three times the internal diameter of the pipes.

(9) When the change of direction of flow is more than 90 degrees—

(a) a series of bends shall be installed, each of which shall comply with the fore-going requirements of this section; or

(b) the change of direction of flow may be made within a manhole with channel bends complying with the requirements of C.A.S. No. A16.

(10) Should channel bends of any approved material other than earthenware be used, these channel bends shall have radii not less than those specified for earthenware channel bends.

(11) Any change in the vertical direction exceeding 5 degrees or a sudden drop in invert level of 300 millimetres or more in a sewer shall be made with square or ramp junctions or bends the dimensions of which shall comply with C.A.S. No. A16.

JUNCTIONS TO SEWERS

68. (1) Every branch sewer shall join another sewer in the direction of the flow of such sewer at an included angle of 45 degrees and as near as practicable to the invert thereof.

(2) All earthenware junctions shall be made by means of ordinary or channel junctions complying with the requirements of C.A.S. No. A16.

JOINTS IN SEWERS

69. (1) All sewer-pipes shall be centred and joined concentrically with the invert on true line.

(2) If sewers are constructed of cast-iron socketed pipes, the joint shall be secured to a depth of at least half the socket depth with molten lead, run in one pouring, or with lead wool, properly caulked.

(3) If sewers are constructed of cast-iron flanged pipes, the joints shall be securely bolted together with insertion material, to the approval of the local authority, placed between the faces of the flanges.

(4) If sewers are constructed of glazed-earthenware pipes or other non-metallic pipes, the joints shall be made to the manufacturer's specification and to the approval of the local authority.

SEWERS ON BAD OR MADE-UP GROUND

70. All sewers on bad or made-up ground or ground producing unequal bearing shall be laid in a manner in all respects satisfactory to the local authority, which shall take into consideration the nature of the ground and the properties of the pipes and joints being used.

SEWERS WITHIN OR UNDER BUILDINGS

71. (1) No sewer or part thereof may be laid or may pass, as the case may be, within or under or through a building unless the local authority decides otherwise, having regard to considerations of health and maintenance or other matters relevant to the particular case.

(2) Every sewer or part thereof, where it is under a building, shall be—

(a) without change of direction or gradient and without means of access thereto except as provided for in section 73; and

(b) laid on a bed of concrete at least 100 millimetres thick, having a composition of not more than six parts of coarse aggregate to three parts of fine aggregate to one part of Portland cement; and

(c) if the local authority has approved the use of glazed earthenware, encased in similar concrete having a minimum thickness at all points of 100 millimetres, measured from the external surface of the pipe.

(3) Where a sewer or part thereof is laid in an exposed position within a building, it shall be constructed of cast-iron pipes, and shall be adequately supported at intervals not exceeding 2 metres along its course.

(4) No part of the mass of a wall or foundation shall bear upon a sewer which passes under or through it.

DEPTH OF COVER TO, AND PROTECTION OF, SEWERS

72. (1) All sewers, other than cast-iron sewers, having less than 300 millimetres clear cover over the socket of the pipe shall be adequately protected by encasing in concrete not less than 100 millimetres thick, having a composition not inferior to 50 kilograms of cement to 100 cubic decimetres of fine aggregate to 200 cubic decimetres of coarse aggregate, Grade 10.

(2) Where, in the opinion of the local authority, sewer-pipes may be damaged by vibration or external pressure, they shall also be encased in similar concrete.

ACCESS TO SEWERS

73. (1) Means of access shall be provided in sewers at distances between every such means of access not exceeding 50 metres in the case of 100-millimetre-

diameter sewers, and 80 metres in the case of 150 millimetre or larger diameter sewers.

(2) Access-eyes or rodding-ways for sewers shall have a minimum diameter of 100 millimetres.

(3) Rodding-ways on sewers passing under paved areas shall be brought to the surface, and shall be covered with suitably marked movable paving-blocks or cast-iron covers at least 300 millimetres square.

(4) Where rodding-ways have raking arms, the latter shall join the sewer in the direction of flow, and shall be at an angle of not more than 35 degrees from the horizontal unless the local authority approves, in writing, of a steeper angle.

(5) Such raking arms shall have the same diameter as that of the sewer they serve.

(6) Access-eyes, rodding-ways and manholes shall be gastight and watertight, and shall be fitted with identifiable covers at adjoining ground-level, but, where a manhole or rodding-way is permitted within a building, it shall be fitted with a screwed or bolted double-sealed gastight and watertight cover at adjoining floor-level.

(7) Rodding-ways having raking arms shall be sealed with an access-cover, bedded and screwed or bolted.

(8) Where the sewer is more than 2 metres deep, access shall be by means of a manhole:

Provided that a rodding-way may be permitted with the prior written approval of the local authority.

ACCESS TO RAMPS OR BACK-DROPS

74. Every ramp or back-drop exceeding 750 millimetres in length shall be provided with an access-eye or other means of access at its head.

ACCESS TO BRANCH SEWERS

75. Every branch or part of a sewer exceeding 3 metres in length shall be provided with an access-eye or other means of access at its top end.

ACCESS TO SEWERS AND PUBLIC SEWERS

76. A manhole or other approved means of access shall be constructed on the premises upon which a sewer is laid, and shall be located not more than 1,2 metres from the connexion of such premises, or in such position as may be authorized by the local authority, in order to afford ready access to such sewer and to the public sewer;

Provided that a rodding-way may be permitted with the prior written approval of the local authority.

CONSTRUCTION AND SIZE OF MANHOLES

77. (1) The walls of every manhole installed on a sewer shall be—

(a) constructed of brickwork not less than 200 millimetres thick, composed of bricks, complying with the requirements of C.A.S. No. A35, Burnt clay building bricks and blocks, set in cement mortar having a composition not inferior to three parts of sand to one part of cement by volume; or

(b) of concrete construction of either—

(i) a minimum thickness of 150 millimetres of cast-in-situ concrete; or

(ii) a minimum thickness of 100 millimetres of pre-cast vibrated concrete; or

(iii) a minimum thickness of 60 millimetres of pre-cast spun reinforced concrete tube.

(2) The base of every manhole shall be not less than 150 millimetres thick and shall be constructed of Grade 20 concrete.

(3) The invert and channel shall be properly formed with salt-glazed earthenware channels, or other approved materials, the sides of the channel being raised up vertically to the level of the pipe soffit and benched therefrom at a slope of 1 in 6, steel-trowelled to a smooth finish.

(4) Single-seal or double-seal covers of cast iron complying with the requirements of S.A.B.S. 558, Cast iron surface boxes and manholes and inspection covers and frames, shall be used, and shall be—

(a) raised 100 millimetres above ground-level; or

(b) installed in such manner and at such a greater height above ground-level as shall, in the opinion of the local authority, exclude surface-water and storm-water.

(5) Heavy-duty types of cast iron covers complying with the specification referred to in subsection (4), shall be used in areas subject to heavy vehicular traffic.

(6) The recesses of manhole-cover frames shall be filled with anti-friction grease, and the covers shall be set in the recesses so as to form gastight coverings.

(7) The minimum inside dimensions of manholes shall be 600 millimetres in length by 450 millimetres in width up to 1 metre deep, and 900 millimetres in length by 600 millimetres in width over 1 metre deep:

Provided that the local authority may permit the use of circular manholes of equivalent size, and may demand larger manholes than those specified in this section where conditions render such larger manholes necessary.

(8) Where required by the local authority, approved metal rungs for the purpose of access shall be built into the wall of every manhole exceeding 1,25 metres in depth.

PART V

SEPTIC TANKS AND PRIVATE DISPOSAL PLANTS

GENERAL

78. (1) No person shall, on any premises, construct or use any septic tank and appurtenant disposal works for the treatment and disposal of sewage without the written consent of the local authority.

(2) Before giving such consent, the local authority shall be satisfied that such septic tank and such disposal works can be operated without nuisance or

danger to public health, and that it is impracticable to connect the premises in question to the public sewer.

SEPTIC TANK: DESIGN AND CONSTRUCTION

79. (1) Every septic tank shall be sited, designed and constructed to the approval of the local authority, and in accordance with C.A.S. No. CA1, Small domestic septic tank installations.

(2) Septic tanks shall be water tight and no spring-water, subsoil-water, surface-water, or storm-water shall be permitted to enter them.

(3) Septic tanks shall be effectively covered and protected so as to minimize odour therefrom and to prevent the breeding of mosquitoes.

(4) Should a septic tank be constructed in any area likely to be used for vehicular traffic, the cover shall be designed to withstand the loads provided for under Chapter 3.

PERCOLATION TESTS FOR SOAK-AWAYS FOR DISPOSAL OF EFFLUENT FROM SEPTIC TANKS

80. (1) Unless exempted by the local authority, a person submitting an application for the construction of a septic tank and appurtenant disposal works shall arrange for percolation tests in accordance with C.A.S. No. CA1 to be carried out during the months of February or March.

(2) The provision of effluent disposal systems shall be determined in accordance with C.A.S. No. CA1 on the basis of these tests.

(3) Approval will only be given for the use of any septic tank where the suitability of soil for tank effluent disposal systems has been proved, or where an alternative effluent system to the satisfaction of the local authority is provided.

CONSERVING-TANKS

81. (1) No person shall construct or use any conserving-tank without the written consent of the local authority.

(2) If the local authority consents to the construction of a conserving-tank, the tank shall conform to the requirements of the following subsections.

(3) Except as provided for in subsection (4), the net capacity Q (calculated by using the depth as measured from the invert-level of the inlet-pipe to the floor of the tank) shall be not less than—

$Q = d \times c \times q$ litres

where—

d = the maximum number of days between complete evacuations of the tank;

c = the number of contributors to the tank;

q = in the case of residential and institutional buildings, 120 litres;
or
in the case of business and public buildings, 30 litres.

(4) A conserving-tank shall have a minimum capacity of 5 000 litres, but such capacity shall, in any case, be sufficient for at least five days' storage.

(5) The suction lift in the suction-pipe shall not exceed 2,1 metres at an altitude of 2 000 metres above sea-level and 3 metres at sea-level. In localities between these altitudes the maximum permissible lift shall be determined by interpolation.

(6) The tank shall be so constructed that any gas forming in the tank can escape along the sewer through the vent-pipe at the top of the sewer to which such tank is connected.

(7) The tank shall be placed as near as possible to a street boundary, so that it can readily be emptied. If this is not possible, a convenient means of access to the tank shall be provided.

(8) The tank shall be provided with a manhole, constructed in accordance with the provisions of section 77, for inspection and cleaning of the tank. Such manhole shall be brought up to above ground-level, so as to prevent spring-water, subsoil-water, surface-water or storm-water from entering the tank.

(9) The tank shall be watertight.

(10) The tank shall be designed so as to support 300 millimetres of earth cover over the top of the covering slab. Where vehicular traffic might pass over the slab, the additional load imposed upon such slab due to the passage of such vehicular traffic shall be taken into account in the design of the tank.

SEWAGE LIFTS

82. (1) Where a sanitary fitting is below the level of a public sewer, or is at a level which is not sufficient to secure a self-cleansing velocity of flow to such sewer, or where, in the opinion of the local authority, there is a risk of back-flow in the event of such sewer becoming surcharged, the sewage from such fitting shall be raised by ejector, pump, siphon or other approved mechanical appliance to such height as may be required by the local authority, and discharged into such sewer, as and where, and at such maximum rate and at such times, as directed by the local authority.

(2) An efficient non-return-flow valve and a trap shall be fixed prior to connexion with such sewer, and shall be maintained in good working order.

(3) The waste-pipe or soil-pipe leading to such ejector, pump, siphon or other approved mechanical appliance shall be provided with a vent which, in the case of such soil-pipe, shall be not less than 100 millimetres in internal diameter, and, in the case of such waste-pipe, shall be at least of the same internal diameter as such waste-pipe.

DRAINAGE FOR STABLES, ETC.

83. The sewerage from stables, cowsheds, dairies, market-places, abattoirs, areas for washing vehicles and other places of a like nature shall be connected to a public sewer or, if such is not available, to private treatment and disposal plants or to conserving-tanks, and, in addition, the following requirements shall be complied with—

(a) provision shall be made, to the satisfaction of the local authority, for the prevention of entry of rain-water into such public sewer, private treatment and disposal plants or

conserving-tanks, either by roofing the area used for the above purposes or by other approved means;

(b) the place to be connected shall be paved and graded to the satisfaction of the local authority;

(c) the private sewer serving such place shall be provided with an effective silt-trap or petrol-trap or grease-trap with removable grating.

PART VI

STORM-WATER DRAINAGE AND USE OF SEWERS

CONNEXION OF PRIVATE DRAINS TO PUBLIC DRAINS PROHIBITED

84. No person shall cause or permit any private drain to communicate with any public drain, and no person shall cause or permit any spring-water, subsoil-water, surface-water or storm-water to flow into any public drain except with the permission of, and subject to conditions laid down by, the local authority.

RAIN-WATER GUTTERS AND DOWN-PIPES

85. (1) The roof of every building shall have proper rain-water gutters and down-pipes constructed in either:

(a) galvanized sheet steel not less than 0,55 millimetre in thickness; or

(b) aluminium or aluminium alloy not less than 0,7 millimetre in thickness; or

(c) copper not less than 0,7 millimetre in thickness; or

(d) asbestos-cement not less than 8 millimetres in thickness for diameters up to 125 millimetres, and not less than 10 millimetres for diameters greater than 125 millimetres or for box gutters and fittings of corresponding size; or

(e) unplasticized polyvinyl chloride in accordance with the requirements of C.A.S. 156; or

(f) of other approved materials:

Provided that, in the case of single-storey buildings which do not abut a street, such gutters and down-pipes may be omitted when the overhang of the eaves beyond the wall-face is not less than 500 millimetres and the surface of the ground beneath the eaves is paved for a distance of 1 metre beyond the face of the wall.

(2) Where dissimilar metals are used in gutters, down-pipes or their appurtenances, precautions shall be taken to prevent galvanic corrosion by painting with bitumen-based paint or other method approved by the local authority.

(3) Gutters shall be supported by a bracket at each joint, and, if the length of gutter between joints exceeds 1,25 metres, by an intermediate bracket between joints as well.

(4) Gutters shall have a slope of not less than 1 in 200 towards outlets.

(5) The fixing and jointing of gutters, down-pipes and appurtenances thereto shall allow for expansion and contraction caused by variations in temperature.

(6) The size of a rain-water gutter shall be calculated on the basis of at least 7 square centimetres of cross-sectional area for every 5 square metres of roof area served by such gutter.

(7) The size of a rain-water down-pipe shall be calculated on the basis of at least 7 square centimetres of cross-sectional area for every 7 square metres of roof area served by such down-pipe.

SIZE OF PRIVATE DRAINS

86. No private drain shall have a diameter of less than 100 millimetres, but the local authority may require the construction of larger private drains where it considers it necessary so to do.

CONNEXIONS WITH DOWN-PIPES PROHIBITED

87. No rain-water down-pipe shall be used as a waste-pipe, soil-pipe or vent-pipe, nor shall any waste-pipe, soil-pipe or vent-pipe be used as a rain-water down-pipe.

BUILT-IN PIPES FOR RAIN-WATER

88. All rain-water down-pipes, if built in so as to be inaccessible, shall be of cast iron which has been effectively proofed against corrosion, or of screwed, galvanized mild steel, U.P.V.C. or other approved pressure-piping capable of withstanding a hydraulic head equal to twice the height of the pipe.

STORM-WATER NOT TO FLOW INTO SEWERS AND SEPTIC TANKS

89. (1) No person shall cause or permit any spring-water, subsoil-water, surface-water or storm-water, or any drain, to discharge or flow into any sewer except with the prior written permission, or by direction, of the local authority, which permission or direction shall be subject to the conditions, *inter alia*, that any such spring-water, subsoil-water, surface-water, storm-water or drain shall discharge into a trapped gully above the level of the water in the trap.

(2) In no case shall any spring-water, subsoil water, surface-water or storm-water be discharged or permitted to flow into any septic tank or similar works.

SEWAGE NOT TO FLOW INTO DRAINS OR STORM-WATER CHANNELS

90. (1) No person shall cause or permit any sewage or trade effluent, or any private sewer, to discharge into or communicate with any private or public drain or open storm-water channel.

(2) No person shall cause or permit to be discharged into any private drain, public drain or open

storm-water channel any liquid, substance or material which, if discharged into a stream, would not comply with the provisions of the Water Act, 1976.

(3) Where the hosing down or flushing by rain-water of an open area on any private property is likely to cause the discharge of objectionable material into any street, gutter, storm-water drain, river, stream or other watercourse, whether natural or artificial, or to cause or contribute towards the pollution of any such watercourse, the local authority may instruct the owner of the property to execute, at his own cost, whatever measures by way of alterations to the drainage installation or roofing of the area which it may consider necessary to prevent or minimize such discharge or pollution.

(4) The owner or occupier of land on which any liquid other than potable water is stored or processed shall provide all facilities necessary to prevent any leakage or escape of such liquid to any street, storm-water drain or watercourse.

DISCHARGE FROM SWIMMING-BATHS

91. (1) No water shall be discharged directly or indirectly from a swimming-bath into a sewer unless written permission to do so shall first have been obtained from the local authority.

(2) Any such written permission shall be subject to such conditions as the local authority shall determine, including, in particular, a condition that the permission may be revoked at any time on the local authority giving one week's written notice of such revocation.

(3) No water from a swimming-bath shall, without the written permission of the local authority first had and obtained, be discharged directly or indirectly into a public drain.

PART VII

CLEANING, INSPECTION AND TESTING

CLEANING OF PLUMBING AND SEWERAGE SYSTEM BEFORE USE

92. All parts of sewers and of the plumbing system shall, after installation or repairs, and before being used, be left clean of all jointing compounds, metal filings, loose solder or any other material liable to cause electrolytic action, stoppage or damage of any kind.

MATERIAL AND LABOUR

93. All equipment, materials and labour necessary to enable the local authority to inspect or test any plumbing work or sewerage work shall be furnished by the person executing such plumbing or sewerage work.

DEFECTIVE MATERIAL OR WORKMANSHIP

94. If the inspection or testing of sewerage work or plumbing work reveals the presence of defective material or work, such defective material or work shall be replaced or redone, and the inspection and test or tests shall be repeated, until such plumbing work or sewerage work satisfies the tests prescribed by section 95.

TESTS

95. On completion of all sewerage and plumbing work, but before such work is connected to a conserving-tank, a septic tank or a public sewer, such work shall be inspected by one of the local authority's authorized employees, and any or all of the following tests shall, in the presence of such employee, be applied, and such work shall withstand such tests to the satisfaction of the local authority—

(a) for all sewerage work—

(i) the interior of every pipe or series of pipes between two points of access shall be inspected throughout its length by means of a mirror and a source of light; a full circle shall appear to the observer, and the pipe or series shall be seen to be unobstructed;

(ii) a smooth ball having a diameter of between 12 and 25 millimetres less than the nominal diameter of the pipe shall, when inserted at the higher end of the pipe or series of pipes, roll down without assistance or interruption to the lower end;

(iii) before any pipe or series of pipes is covered, all openings of the pipe or series of pipes to be tested having been plugged or sealed, air shall be pumped into the said pipe or series of pipes until a manomic pressure of 100 millimetres of water is indicated, after which without further pumping the said pressure shall remain greater than 75 millimetres for a period of at least 10 minutes;

(iv) after all the trenches have been refilled to ground-level, the same test as set out in sub paragraph (iii) shall be applied, except that the stated pressure shall be maintained for 3 minutes;

(b) for all plumbing work, before any pipe or series of pipes is covered, all openings of the pipes or series of pipes to be tested having been plugged or sealed, and all traps associated therewith filled with water, air shall be pumped into the pipe or series of pipes until a manomic pressure of 40 millimetres of water is indicated, after which, without further pumping, the said pressure shall remain greater than 25 millimetres for a period of at least 10 minutes.

APPROVAL CERTIFICATE

96. No person shall use any plumbing or sewerage system before a certificate of approval has been issued in terms of section 45 of Chapter 2.

INDEX—CHAPTER 10

CHAPTER 10

VENTILATION

ARRANGEMENT OF SECTIONS

Section

INTERPRETATION OF TERMS

1. In this Chapter—

"clear height of a room" means the vertical distance from floor to underside of ceiling, or, if there is no ceiling, to the underside of rafters, beams, tie-beams or joists;

"court" means an unobstructed open space which abuts one or more of the external walls of a building, and which is located on the same stand as such building:

Provided that, where a court in any stand abuts—

(a) a contiguous court on an abutting stand, and the local authority is satisfied that such contiguous court will not be detrimentally altered in size or shape during the life of any building served or to be served by the court first mentioned; or

(b) an area on an abutting stand, which area is in terms of any law required to be kept free of any building or structure; or

(c) a street;

such court may, for the purposes of this Chapter, be deemed to include such contiguous court or such area or such street as the case may be;

"floor area" means the plan area of a room measured between internal-finished wall surfaces;

"habitable room" means any room designed for human occupation, but excluding bath-rooms, water-closets, stairways, passageways, lift-cars, photographic darkrooms, sculleries, domestic laundries, coldrooms or garages used for parking alone;

"natural ventilation" means ventilation by natural means requiring no machinery;

"required ventilation-openings" means openings required to be provided by and complying with the provisions of this Chapter;

"ventilation-opening" means any opening in the wall of a room, whether permanently open or capable of being opened and shut, through which air may flow by natural means into or out of such room.

DIMENSIONS OF HABITABLE ROOMS

2. (1) Every habitable room shall have a clear height of not less than that set out in subsection (2), over the percentage of floor area of such room set out in subsection (3) and shall otherwise comply with the provisions of subsection (4).

(2) The clear height referred to in subsection (1) shall be as follows—

(a) in dwellings, 2,4 metres;

(b) in shops, 2,9 metres;

(c) in all other buildings, 2,6 metres.

(3) The percentage of floor area referred to in subsection (1) shall be as follows—

(a) where a steeply pitched roof forms part of the walls or ceiling of such room (as in attics), at least 50 *per centum*;

(b) in all other cases, at least 75 *per centum*.

(4) Although the requirements of subsections (1) and (2) may have been complied with, in the following portions of a habitable room the minimum clear height shall be 2,1 metres—

(a) in any portion of such room leading to or giving access to doors or windows;

(b) in any portion of such room at a horizontal distance from the walls of 1,5 metres.

(5) In all habitable rooms, except kitchens, the minimum floor area over which the minimum clear height of the room of 2,4 or 2,6 or 2,9 metres, as the case may be, is maintained shall be 7 square metres, measured exclusive of immovable objects, such as columns, stairways and built-in cupboards, and such minimum floor area shall have a minimum horizontal dimension of 2,1 metres.

CONTAMINATION OF AIR

3. Wherever conditions of high temperature may be created, or where steam, gases, vapour, dust or other impurities in the air may be produced, which may be injurious to health, all rooms or local areas within

rooms affected by these conditions shall be provided with ventilation additional to that required by sections 5 and 6 to the satisfaction of the local authority in such a manner as to prevent harm to any person whether within or without such rooms:

Provided that, where noxious gases, vapours or dust are produced, provision shall be made to extract them from the rooms or areas concerned.

PROVISION OF VENTILATION

4. Every habitable room shall be provided with natural ventilation, in accordance with the requirements of sections 5 and 6, unless it is provided with mechanical ventilation, in accordance with the requirements of section 7.

REQUIRED VENTILATION-OPENINGS FOR HABITABLE ROOMS

5. (1) *Minimum area of openings.*—Every habitable room shall have required ventilation-openings in the walls of an aggregate area of not less than 5 *per centum* of the floor area, but in no case less than 0,5 square metre:

Provided that, in the case of habitable rooms having a floor area exceeding 50 square metres, the local authority may permit ventilation-openings, other than skylights, in roofs of the monitor, saw-tooth or similar types in lieu of part of the ventilation-openings in walls, of an aggregate area not exceeding half the area afore mentioned.

(2) *Position of openings in walls.*—Subject to the provisions of section 6, required ventilation-openings in the walls of any habitable room shall be so positioned that they are contained in an external wall or walls.

(3) *Measurement of area of required ventilation-openings.*—In computing the area of required ventilation-openings in the walls of a room, the following provisions shall apply—

(a) such area shall be measured in the plane of the wall;

(b) where ventilation-openings are covered by wire gauze used as mosquito- or fly-screening, the ventilating area shall be taken as 40 *per centum* of the net area, excluding frames, of the openings obstructed by such gauze.

(4) *Requirements for cross-ventilation.*—Where the ventilation-openings required under subsection (2) are situated in one external wall, additional ventilation shall be provided by means of—

(a) permanently open ventilation openings having a total effective open area of not less than 0,03 square metre so placed as to secure cross-ventilation and such openings shall be a minimum of 2 metres from the floor; or

(b) other controlled ventilation devices to the satisfaction of the local authority.

(5) *Required ventilation-openings in rooms containing screens and partitions.*—Where a habitable room, which complies with the requirements of this Chapter, is subdivided by means of screens or partitions which do not exceed 2,1 metres in height, no allowance need be made for the effect of such subdivisions in determining the positions of the required ventilation-openings for such room.

(6) Where subdivisions of a habitable room are formed by screens or partitions higher than 2,1 metres, each such subdivision shall be ventilated either as if it were a separate habitable room or by means of mechanical ventilation to the approval of the local authority.

(7) *Mechanical ventilation.*—A means of mechanical ventilation to augment the natural ventilation requirements of this section may be utilized to the approval of the local authority.

AIR-SUPPLY TO REQUIRED VENTILATION-OPENINGS

6. (1) Fresh air shall be admitted to required ventilation-openings contained in external walls directly from the open air, from a court or a street or public place, or else from a roofed porch, veranda or balcony (hereinafter referred to as a "covered area"), complying with subsection (2).

(2) Covered areas supplying outside air to required ventilation-openings to habitable rooms shall not extend more than 4,5 metres away from the face of the wall at a required ventilation-opening:

Provided that such covered areas to habitable rooms in a dwelling may be enclosed, if ventilation-openings, complying with the requirements of subsection (2) of section 5, equivalent to 7½ *per centum* of the combined floor areas of the covered areas and adjoining habitable room, are provided in an external wall.

(3) Where any habitable room has only one external wall containing ventilation-openings, the required ventilation-openings contained in internal walls of the room shall be supplied with air from passages or ducts which communicate with—

(a) the open air at points situated either in the roof or in an external wall; or

(b) in the case of dwellings, an approved ventilated passage or room which is not a sleeping-apartment.

(4) Where, in a dwelling, a room opens directly into a passage which supplies air to ventilation-openings in an internal wall of any habitable room, it shall be sufficient, if ventilation, in the form of fanlights, is provided to such passage from another room or rooms having an external wall which does not face in the same direction as the external wall of the room concerned:

Provided that no noxious fumes or gases shall be able to enter such passage from any other room.

(5) In all buildings, other than dwellings, a passage which supplies air to ventilation-openings in an internal wall of any habitable room shall be ventilated directly to the open air at least at one end, or shall be mechanically ventilated.

REQUIREMENTS FOR MECHANICAL VENTILATION SYSTEMS

7. (1) Where it is proposed to provide mechanical ventilation to any building or part thereof, details of the ventilation system concerned shall be set out in working-drawings, and shall be submitted to the local authority for its approval.

(2) Details of working-drawings shall include the maximum quantity of outside air per minute which such mechanical ventilation system can supply continuously to all the rooms to be ventilated, together with the number of persons for whose simultaneous use such rooms are authorized or intended (hereinafter referred to as the "occupancy" of such rooms).

(3) All metal parts of ducts and machinery associated with any mechanical ventilation system shall be electrically bonded to earth.

(4) Any system providing mechanical ventilation in a building shall be maintained in working order, so as to deliver the quantity of air required by subsection (5).

(5) Every mechanical ventilation system shall—

(a) in the case of occupied areas, supply outside or outside-and-recirculated air—

(i) where the occupancy is known, at the rate and in the proportions specified in Table I;

(ii) where the occupancy is unknown, at a rate of 6 cubic metres per hour per square metre of floor area of each room in the proportions specified in Table I;

(b) in the case of services areas, supply outside air or extract air at the rates and by the means specified in Table II.

TABLE I

MINIMUM VENTILATION RATES—OCCUPIED AREAS

Application	Forced ventilation: unfiltered	Forced ventilation: filtered	Air-conditioned spaces
Minimum total air-supply per person	30 m³/h	30 m³/h	30 m³/h
Maximum proportion of re-circulated air	Nil	25%	50%
Minimum proportion of outside air	100%	75%	50%

TABLE II

MINIMUM VENTILATION RATES—SERVICES AREAS

Application	Forced inlet or extract ventilation: filtered	Extract ventilation only
Basement car-parks	20 m³/m³ of floor area per hour, or 6 air changes per hour, whichever is the greater	—
Kitchens (other than domestic)	70 m³/m³ of floor area per hour	—
Toilets	—	35 m³/m³ of floor area per hour

(6) Air may be recirculated only in a mechanical ventilation system and in accordance with the following provisions—

(a) outside air shall be added to the recirculated air at a rate not less than that required by subsection (5);

(b) recirculation of air in a factory, laboratory, workshop or room shall be permitted only if the local authority is satisfied that the recirculated air is sufficiently free from bacteria, dust, fumes, vapours, mists or gases as to be harmless to the occupants of such factory, laboratory, workshop or room;

(c) air shall not be recirculated from passageways, stairways, kitchens, water-closets, urinals, toilets, bath-rooms, lobbies, rooms containing soil-water fittings, rest-rooms or garages:

Provided that it shall be permissible to recirculate air from passageways designed as return airways;

(d) except as may be approved by the Ministry of Health, air extracted from hospital operating-theatres or from any room in an infectious diseases hospital shall not be recirculated.

(7) Quantities of air mechanically supplied or extracted from a room or building shall be measured in or at the openings to the ducts conveying the air.

(8) The size and position of the ventilation-openings in the walls of rooms ventilated by mechanical ventilation shall be such that—

(a) when air is being supplied by mechanical ventilation systems, its velocity, as measured with a velometer or other approved apparatus at six different points selected at random, being not less than 1,2 metres from the ventilation-openings and at heights varying from 750 millimetres to 2,1 metres above the floor, should not be less than 9 metres per minute, and not greater than 18 metres per minute;

(b) no portion of any air-intake opening outside a building shall be at a height of less than 3 metres above the outside ground-level, unless otherwise permitted by the local authority. The positions of all such air-intake openings and of all discharge-points shall be subject to the approval of the local authority, which shall have regard to the possibility of any source of contamination which may be adjacent to any such air-intake openings or which may be caused by any discharge-points, and to any objectionable noise to owners of adjacent buildings;

(c) where air is exhausted above a pavement of a street, no portion of the air-exhaust opening outside a building shall be at a height of less than 3 metres above the level of such pavement.

(9) Every air-supply system with a capacity of 25 000 cubic metres per hour or larger, or such a system supplying a building of more than three storeys, shall

be capable of being automatically and manually stopped in case of fire. The position of the manual stopping-device shall be determined by the local authority.

(10) Any exhaust system from which the air exhausted can be wholly or partially returned to the building by a supply system, shall be arranged to change over automatically to full exhaust when fire is detected by approved automatic means.

REQUIREMENTS FOR NON-HABITABLE ROOMS

8. (1) Non-habitable rooms used mainly as a means of access, such as corridors, stairways and the like, shall have a clear height of not less than 2,3 metres throughout, and all other non-habitable rooms shall have a clear height of not less than 2,1 metres over at least 80 *per centum* of the floor area.

(2) Rooms containing soil-water fittings shall comply with the following requirements—

(a) the minimum internal floor dimensions of a room containing a water-closet shall be 750 millimetres × 1,4 metres;

(b) every room ventilated by natural ventilation and containing one or more than one soil-water fitting (every 500-millimetre length of urinal-stall shall be considered the equivalent of one soil-water fitting) shall be provided with adequate means of permanent ventilation and an unobstructed area of ventilation-opening of at least 0,2 square metre for each such fitting;

(c) the ventilation-opening shall open—
  (i) to the open air; or
  (ii) into a natural ventilation-shaft with a cross-sectional area of at least 1,5 square metres and with a minimum lateral dimension of 900 millimetres; or
  (iii) into a natural ventilation-duct of equal dimensions taken to an approved discharge-point;

(d) where such rooms are ventilated by mechanical ventilation, at least 0,75 cubic metre of air per minute per square metre of floor area of the room shall be extracted by the ventilation system;

(e) every room containing one or more than one soil-water fitting shall be so constructed that such room leads either—
  (i) directly into the open air; or
  (ii) into a lobby or passage ventilated in accordance with the provisions of subsection (4) of section 6; or
  (iii) into a bedroom in a dwelling or an hotel.

(3) Bath-rooms shall be ventilated as required for habitable rooms in sections 5, 6 and 7.

(4) Shower-cubicles shall comply with the requirements of subsection (2), unless such shower-cubicle is contained in a bath-room of a dwelling or hotel suite.

PARKING-GARAGES

9. (1) In rooms with or without windows, used for the keeping or storage of motor vehicles which may be operated under their own power within such rooms, and which rooms are not used for service, repair or maintenance, the provisions of this section shall be observed.

(2) Rooms with floors not lower than the average adjoining finished ground-level shall be ventilated as follows—

(a) in naturally ventilated rooms, when the area of floor of the room is within the range set out in column 1 of Table III, the area of permanent ventilation-openings in the room shall be not less than the area set out in column 2 of that Table;

(b) the value of the area of such permanent ventilation-openings may be read off from the curve in Figure 1;

(c) in mechanically ventilated rooms, when the area of the floor of the room is within the range set out in column 1 of Table III, the volume of air in cubic metres per minute, which must be extracted from the room, shall be not less than the volume set out in column 3 of that Table;

(d) the value of such volume may be read off from the curve in Figure 2;

(e) at least half the quantity of air referred to in paragraph (c) shall be extracted from within a height of 600 millimetres above the floor;

(f) rooms with floors lower than the average adjoining finished ground-level shall be mechanically ventilated, as required in paragraphs (c), (d) and (e);

(g) garage-pits and wells within garages shall have at least 0,3 cubic metre of air per minute per square metre of floor area of the pit or well, extracted by mechanical ventilation, and such air shall be extracted from openings positioned within 300 millimetres of the bottom of the pit or well.

TABLE III

REQUIREMENTS FOR VENTILATION OF PARKING-GARAGES

1	2	3
Area of room A, in square metres	Naturally ventilated rooms: Minimum area of permanent ventilation-openings in room, in square metres	Mechanically ventilated rooms: Minimum volume of air to be extracted from room, in cubic metres per minute
Not exceeding 140	0,02A	0,12A
141 to 220	(0,1A–11)	(1,3A–220)
Exceeding 220	0,0 5A	0,3A

LIFT-CARS

10. Each passenger lift-car shall be provided with permanently open ventilation-openings equivalent in area to at least 4 *per centum* of the area of the car-floor, and at least half of this area shall be either in, or not more than 150 millimetres below, the car-roof:

Provided that, where air is extracted by mechanical ventilation from the car, the area of per-

FIGURE 1

NATURALLY VENTILATED ROOMS

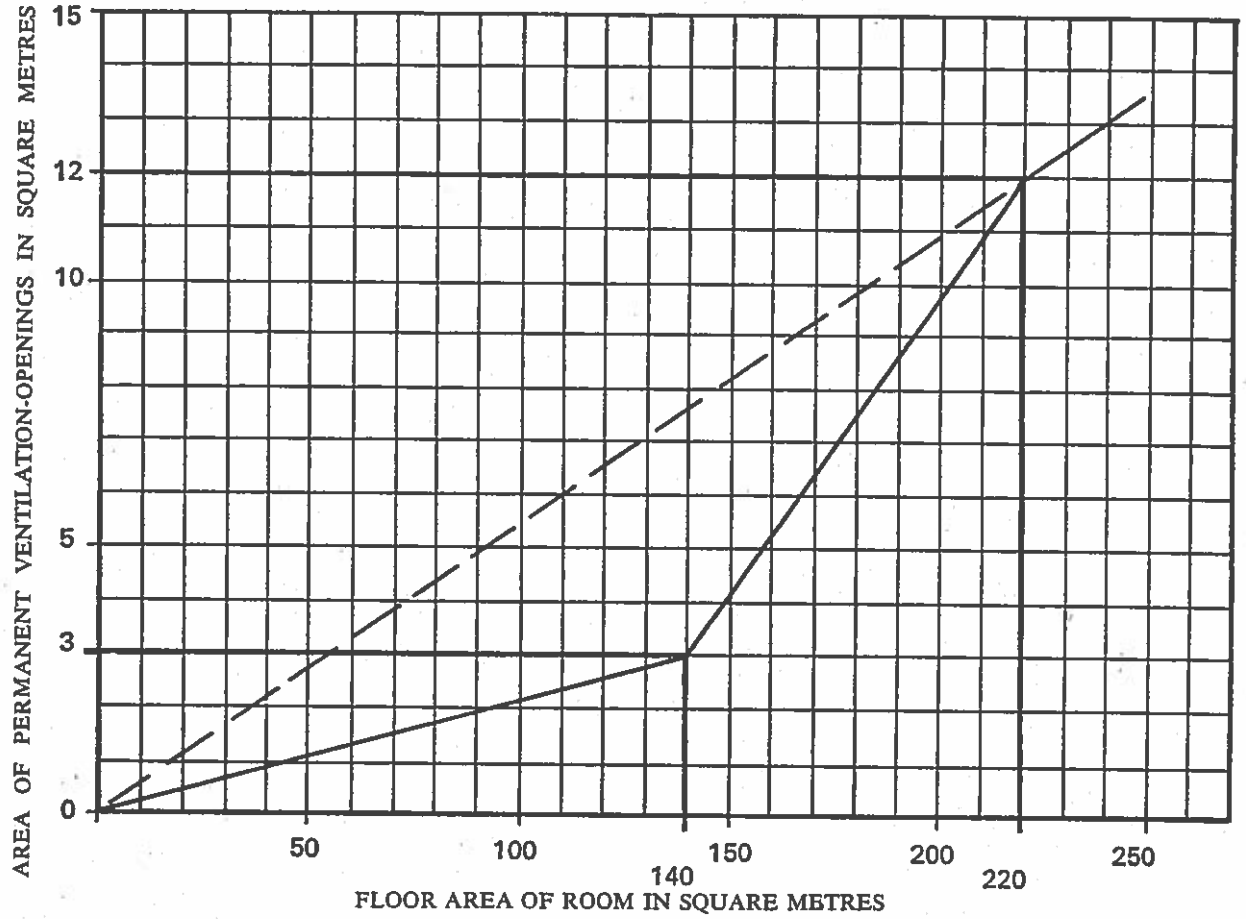
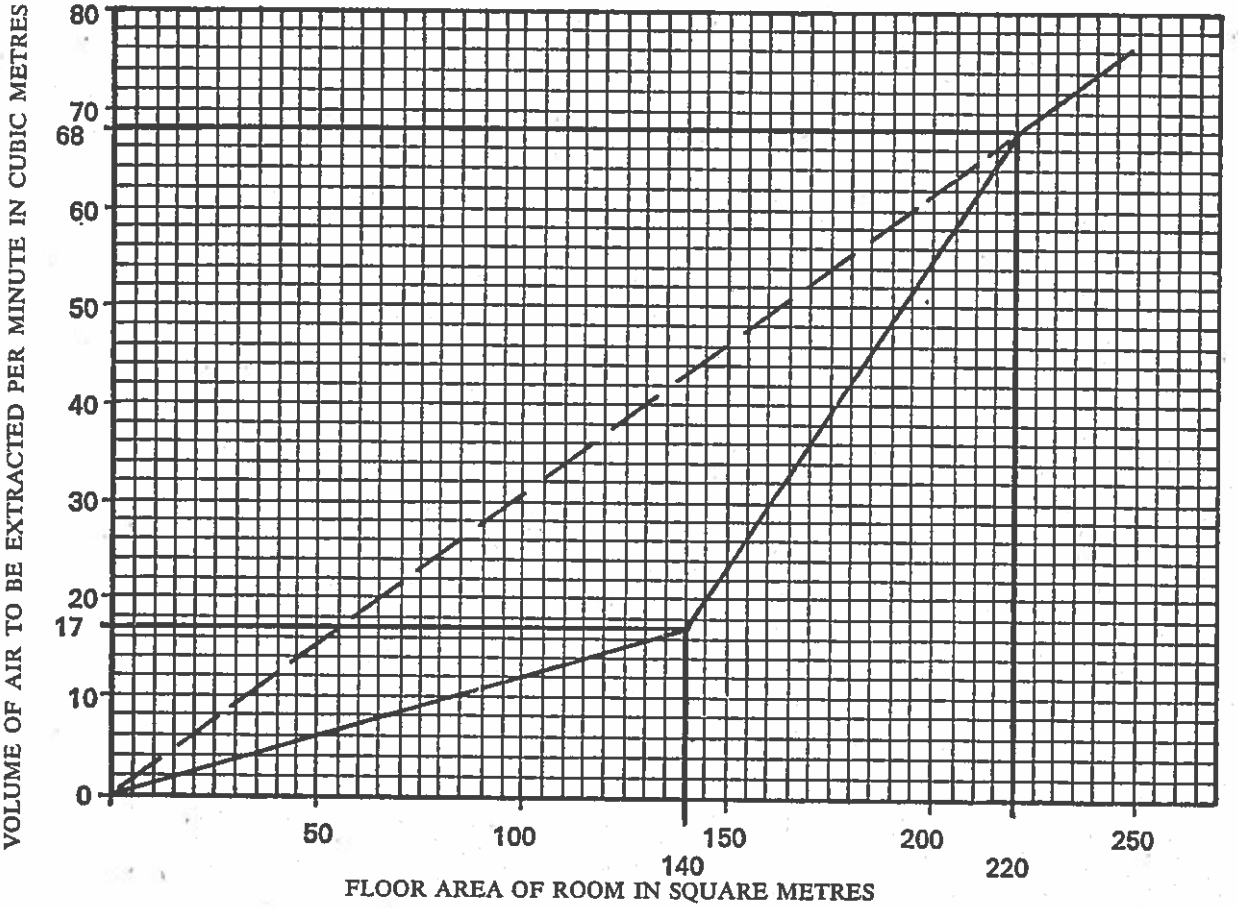


FIGURE 2

MECHANICALLY VENTILATED ROOMS



manently open ventilation-openings need be equivalent to only 2 *per centum* of the area of the car-floor.

OPEN FIRES

11. Wherever open fires are used within habitable rooms, means of natural ventilation (chimneys) or mechanical exhaust ventilation shall be provided to discharge all resultant gaseous products of combustion above the roof of the building containing the room.

COMMON OR PARTY-WALLS

12. Where separate dwellings are located under a common roof, the walls between such dwellings shall not be perforated by any ventilation-opening.

COURTS

13. (1) No court shall have a horizontal dimension of less than 1,5 metres.

(2) Courts in which all walls exceed 10 metres in height, which are not open to the air on at least one side, shall be ventilated at their lower extremity by ventilated openings communicating with the open air outside the court, or other means approved by the local authority.

CHAPTER 11 TO PREVAIL

14. In the event of any conflict between the provisions contained in this Chapter and the provisions of Chapter 11, the latter shall prevail.

INDEX—CHAPTER 11

CHAPTER 11

FIRE PROTECTION

ARRANGEMENT OF SECTIONS

PRELIMINARY

PART VI

WATER-SUPPLY FOR FIRE-FIGHTING SERVICES

Section

PART VII

GENERAL

PRELIMINARY

INTERPRETATION OF TERMS

Note.—Before any building proposal is checked against the provisions of this Chapter, it is suggested that clarity is obtained on the uses to which the various portions of the building will be or may be put, for this will determine both its classification(s), in terms of section 4, into one or more of classes 1 to 11 and grades A to D, and its designated "fire-load", "low", "moderate" or "high", in terms of subsection (1) of this section.

1. (1) In this Chapter—

"arcade" means a pedestrian passage at street-level, of not less than 6 metres in width, which passes through a building or between buildings from one street to another, and which is permanently open at both ends;

"automatic", as applied to fire-doors, fire-shutters, fire-alarms and fire-extinguishing equipment, means that these are fitted with a device which, without any manual operation, causes the performance of the required function;

"automatic fire-alarm system" means a system which—

(a) automatically detects the outbreak of fire in the occupancy-unit it serves; and

(b) actuates a fire-alarm signal or device;

"business, commercial or industrial occupancy" means the occupancy for the transaction of business, the rendering of professional services or the display, sale, packing, manufacturing or processing of goods, materials, food or drink, or for the purpose of manual, clerical or other work, and, without derogation from the generality of the foregoing, includes occupancies for—

bakeries;	laboratories;	power-plants;
banks;	laundries;	radio stations;
electric substations;	markets;	shops;
factories;	offices;	telephone exchanges;
hairdressing saloons;		workshops;

but shall not include a place of assembly;

"chimney" means a masonry or concrete shaft enclosing one or more flues;

"combustible", as applied to material, means material which is classified as combustible when tested, as described in the combustibility test set out in the Fourth Schedule;

"division", as applied to a building, means a portion of a building separated from the remainder of the building by—

(a) one or more division-walls; or

(b) one or more division-floors; or

(c) a combination of such walls and floors;

"division-floor" means a floor which—

(a) serves to divide a division of a building horizontally from the remainder of the building; and

(b) has a required fire-resistance rating;

"division-wall" means a wall which—

(a) serves to divide a division of a building vertically from the remainder of the building; and

(b) has a required fire-resistance rating;

"dwelling-house" means a dwelling designed for occupation by a single family or household, and includes a semi-detached dwelling or a dwelling in a terrace of houses and any building appurtenant thereto, but does not include a dwelling-unit;

"dwelling-unit" means a flat or maisonette or other similar portion of a building designed for occupation by a single family or household for living purposes;

"exit" means the point of egress from an exit-way to a public street or arcade or to a public place, whether this be an exit doorway or the mouth of an exit-court;

"exit-court" means an open space, unoccupied from the ground upwards, on the same stand as that on which the building such court serves is erected, and which is bounded by walls or boundaries, or by both walls and stand boundaries, which is a component of an exit-way;

"exit-way" means a series of components forming a route of egress or escape from any room in a building, as described in section 23;

"fire-door" or "fire-shutter" means a door or shutter and its assembly especially constructed and assembled in place so as to give a specific fire-resistance rating;

"fire-load[1]" means the degree of fire hazard produced by the contents of an occupancy-unit, characterized as "low", "moderate" or "high"[2];

[1] For fire-loads where explosives are held, attention is drawn to the provisions of the Explosives Act [*Chapter 307*], which requires application to be made to the Ministry of Mines for a licence to keep or store explosives in or on any premises.

[2] See also subsection (2) of this section.

"low fire-load" means the fire-load for all occupancy-units, the combustible content of which, together with normal furniture and fixtures, does not at any time exceed 5 *per centum* by volume of the occupancy-unit concerned:

Provided that factories or shops processing, utilizing or storing at least 90 *per centum* of non-combustible materials, such as hardware-shops, bicycle-shops and concrete-block factories, shall be deemed to be occupancy-units having a low fire-load;

"moderate fire-load" means the fire-load for occupancy-units other than high fire-load or low fire-load;

"high fire-load" means the fire-load for occupancy-units, the occupation and use of which involves—

(a) the storage, keeping, manufacture, packaging, processing, use or sale of goods or materials—

(i) which are liable to burn with extreme rapidity; or

(ii) from which poisonous fumes or explosions may be expected, in the event of the outbreak of fire;[3]

or

(b) uses or processes which result in small particles of combustible material being suspended in the air, so as to be liable to result in an explosion; or

(c) the storage of combustible materials or materials in combustible containers in such a way that conditions for the rapid spread of fire are created, such as the stacking of such containers to a height exceeding 4,5 metres, or in stacks with small gaps between them;

"fire-resistance rating" means the minimum length of time for which a structural element or a separating structure will resist fire, based on the standard fire test set out in the First Schedule;

"fire-stopping" means a method of preventing the spread of fire within walls and partitions and between floors and ceilings, and in other concealed spaces in a building, by the insertion of a non-combustible filling in voids and concealed spaces so as to restrict the passage of air;

"fire-valve" means a valve fitted to fuel lines which operates automatically in the event of the outbreak of fire shutting off the supply of fuel to the appliance;

"fire-window" means a window and its assembly specially constructed and assembled in place so as to give protection against the passage of fire;

"flammable", as applied to solid substances, means those which are likely to cause fire through friction, absorption of moisture or exposure to air or to heat at temperatures below 65 degrees Celsius; as applied to liquids, means those which give off vapours which are explosive when mixed with air or which burn with extreme rapidity, and those which have a closed-cup (Abel-Pensky) flash-point below 65 degrees Celsius;

"flue" means a passageway for the purpose of removing products of combustion from solid, liquid or gas fuel;

"fuel-fired incinerator" means an incinerator which is supplied with fuel to maintain combustion of the contents, as distinct from an incinerator in which the materials being incinerated themselves constitute the only fuel promoting combustion;

"garage" means a building or portion of a building used to store, keep, house or repair one or more motor vehicles powered by internal-combustion engines;

"industrial high-heat appliances" means those appliances developing temperatures in the heated materials or ovens exceeding 800 degrees Celsius, including, among others, cupolas, brass-furnaces, porcelain-baking kilns and Bessemer retorts;

"industrial low-heat appliances" means those appliances developing temperatures in the heated materials or ovens not exceeding 300 degrees Celsius, including, among others, cooking-ranges, small hot-water boilers, wood-drying furnaces, bake-ovens in bakeries, coffee-roasting ovens and boiling-vats for wood-fibre;

"industrial medium-heat appliances" means those appliances developing temperatures in the heated materials or ovens exceeding 300 degrees Celsius, but not exceeding 800 degrees Celsius, including, among others, high-pressure steam-boilers, charcoal-furnaces, lime-kilns and fertilizer-driers heated by direct fire;

"institutional occupancy" means the occupancy in which persons receive medical, charitable or other care or treatment, or in which persons are involuntarily detained, and, without derogation from the generality of the foregoing, includes occupancies for—

crèches;	maternity homes;	nursing-homes;
homes for the aged;	mental hospitals;	orphanages;
hospitals;	nurseries;	sanatoria;
infirmaries;		

but shall not include a place of assembly;

"lateral boundary", in relation to a building, means a boundary of the stand on which such building is erected, other than a boundary between such stand and a public street or public place, where such public street or public place is more than 4,5 metres in width;

"masonry" means an assembly of non-combustible structural-units of natural stone, cast stone, brick or concrete, or similar building-units bonded together;

"non-combustible", as applied to a material, means a material which is not combustible;

"occupancy" means the use or purpose to which a building or portion of a building is normally put or is intended to be put, according as to whether the use or purpose is—

(a) business, commercial or industrial; or

(b) institutional; or

(c) public and assembly; or

[3] See also subsection (3) of this section.

(d) residential; or

(e) storage;

"occupancy-separation structure" means a wall, floor or other structure which separates one occupancy-unit from another;

"occupancy-unit" means a building or portion of a building used for a particular occupancy;

"partition-wall" means a non-bearing internal wall which is employed solely for the purpose of subdividing any storey of a building into sections;

"petrol-filling station" means a building or any part thereof, where a flammable fluid for direct supply to motor vehicles is kept, stored or sold;

"place of assembly" means a room or space in a building accommodating 100 or more persons, and includes any other room or space, whether on the same storey or another storey of the building, which is connected to, or has a common entrance with, the room or space accommodating 100 or more persons;

"population", in relation to an occupancy-unit, means the population determined in accordance with the provisions of section 25;

"public occupancy" and "assembly occupancy" mean the occupancy in which persons regularly gather together for civic, political, educational, religious, cultural, social or recreational purposes, whether such gathering be of a public, restricted or private nature and, without derogation from the generality of the foregoing, includes occupancy for—

arenas;	colleges (non-residential);	museums;
armouries;	concert-halls;	opera-houses;
bars;	dance-halls;	passenger-stations;
bath-houses;	dining-rooms;	places of assembly;
bowling-alleys;	exhibition-buildings;	places of worship;
cafés;	galleries;	restaurants;
canteens;	grandstands;	schools (non-residential);
cinemas;	gymnasia;	skating-rinks;
circuses;	lecture-rooms;	stadia;
class-rooms;	libraries;	theatres;
clinics;	lounges;	
club-rooms;	mess-rooms;	

"required" means required by the provisions of this Chapter;

"residential occupancy" means the occupancy, other than an institutional occupancy or place of assembly, in which people sleep, and, without derogation from the generality of the foregoing, includes occupancies for—

boarding-houses;	dwellings;	maisonettes;
colleges (residential);	hostels;	monasteries;
convents;	hotels;	motels;
dormitories;	lodging-houses;	residential clubs;
		schools (residential);

"self-closing", as applied to fire-doors, fire-shutters and fire-windows, means a fire-door, fire-shutter or fire-window which is normally held in a closed position by some mechanical device and automatically returns to a closed position whenever it is released after being opened;

"shaft" means a vertical opening or passage, completely or partly enclosed by walls, which passes through two or more floors of a building or through floors and roof;

"smoke-pipe" means a pipe connecting a heating appliance and a flue;

"smoke-stack" means a shaft of material other than masonry or concrete enclosing one or more flues;

"sprinkler" means an automatic sprinkler;

"stairway" means one or more flights of stairs and the landings appurtenant thereto forming a continuous and uninterrupted passage from one storey to another in a building;

"storage occupancy" means the occupancy for the storage or keeping of goods, wares or merchandise, the sheltering of livestock, or the housing of aeroplanes and other means of transport, and, without derogation from the generality of the foregoing, includes occupancies for—

barns;	goods depots;	petrol-filling stations;
cold stores;	grain elevators;	stables;
garages;	hangars;	storage warehouses:

Provided that any store-room or space which—

(a) in the opinion of the local authority is ancillary to an occupancy other than a storage occupancy; and

(b) does not exceed 60 cubic metres in capacity; and

(c) is not used for the storage or keeping of flammable substances;

may be deemed to be used for the occupancy to which, in terms of paragraph (a), it is ancillary;

"tenancy-separation structure" means a wall, floor or other structure which separates one portion of an occupancy-unit from another portion of the same occupancy-unit used by a different tenant or owner;

"tip-up seat" means a seat which tips up automatically by a mechanism actuated by weights, springs or other approved means;

"wall-lining" means a material exceeding 1 millimetre in thickness applied to a wall subsequently to the construction of the wall.

(2) In estimating the degree of fire hazard for the purpose of assessing the fire-load of an occupancy-unit, the estimate shall be based on the assumption that the contents of the unit are uniformly distributed over the total floor area of the unit.

(3) Goods or materials, such as varnishes, cotton, feathers, flour, fireworks, straw, lucerne, kapok, oil-based paints, rubber, certain plastics and similar goods or materials which are not classed as flammable, shall be deemed to fall within the scope of the materials referred to in paragraph (a) of the definition of "high fire-load".

FIRE-RESISTANCE RATING

2. (1) Where a particular fire-resistance rating is required by the provisions of this Chapter for a component or an assembly of components of a building,

such requirement shall be deemed to have been fulfilled, if the component or assembly of components—

(a) has been proved by a test conducted in accordance with the First Schedule to have the required fire-resistance rating; or

(b) is constructed in accordance with the appropriate requirements for the fire-resistance ratings set out in the Second Schedule; or

(c) has been assessed by an approved independent organization to have the required fire-resistance rating.

(2) The provisions of paragraph (b) of subsection (1) shall not apply to a fire-door, as described in Table IX of the Second Schedule, unless there is fixed to such door a metal plate, bearing—

(a) the name of the manufacturer of such door; and

(b) the date of manufacture of such door; and

(c) a certificate in the following form—

"This door is constructed to comply with the requirements prescribed by the Building By-laws for a door having a fire-resistance of ..... hours.".

(3) Fire-doors which otherwise comply with the requirements of Table IX of the Second Schedule for doors having a presumed fire-resistance rating of half an hour, shall retain such rating although one or more openings are provided therein, if such openings are glazed with fire-resisting glazing, in accordance with the specifications set out in the Second Schedule.

ASSESSMENT OF HEIGHT OF BUILDINGS OR OCCUPANCY-UNITS

3. (1) Where the height of a building or occupancy-unit is given in storeys, as set out in this Chapter, the number of storeys shall be regarded as those contained between the floor nearest the finished ground-level, at the point considered, and the roof of such building or the top of such occupancy-unit.

(2) A mezzanine floor having an aggregate floor area exceeding 20 *per centum* of the floor area of the storey in which it is located shall be regarded as a separate storey.

(3) Where the height of a building or an occupancy-unit is given in metres, as set out in this Chapter, the height shall be regarded as the vertical distance between the finished ground-level, at the point considered of such building or occupancy-unit, and the underside of a flat-roof construction or a point halfway up the roof-pitch in a sloping-roof construction.

(4) Where structures which are erected on the roof of a building or an occupancy-unit contain habitable rooms, used as part of the occupancy of such building or occupancy-unit, the height shall be the vertical distance between the ground-level, at the point considered adjoining such building or occupancy-unit, and the underside of the ceilings of such rooms.

PART I

CLASSIFICATION OF OCCUPANCY-UNITS AND CONSEQUENTIAL STRUCTURAL REQUIREMENTS

CLASSIFICATION OF OCCUPANCY-UNITS INTO CLASSES AND GRADES

4. (1) Every occupancy-unit shall—

(a) be classified into one of the classes and grades of construction specified in this section; and

(b) be erected in accordance with the section of these by-laws in which the structural requirements appropriate to the relevant grade are specified.

(2) *Grade A construction.*—Every occupancy-unit which falls into one or other of the following five classes shall be erected in accordance with the requirements specified in this Chapter for grade A construction—

Class 1.—Institutional occupancy-units in which persons are involuntarily detained or in which persons, who by reason of infirmity are unable to help themselves, are housed, of one or more storeys in height;

Class 2.—Theatres, cinemas and opera-houses of one or more storeys in height, and occupancy-units containing a place of assembly above the ground storey;

Class 3.—Institutional and public and assembly occupancy-units, other than those in classes 1 and 2, of three or more storeys or over 10,5 metres in height, places of worship over 13,5 metres in height, and schools and colleges, whether residential or otherwise, exceeding two storeys in height;

Class 4.—Business, commercial or industrial occupancy and residential occupancy-units of five or more storeys or over 15 metres in height;

Class 5.—Storage occupancy-units of two or more storeys or over 10,5 metres in height, but excluding units for the storage of flammable liquids and substances, as provided for in section 44.

(3) *Grade B construction.*—Every occupancy-unit which falls into one or other of the following three classes shall be erected in accordance with the requirements specified in this Chapter for grade B construction—

Class 6.—Institutional and public and assembly occupancy-units, other than those in classes 1 and 2, not exceeding two storeys or 10,5 metres in height, and places of worship 13,5 metres or less in height;

Class 7.—Business, commercial or industrial occupancy-units and residential occupancy-units not exceeding four storeys or 15 metres in height, but exceeding, in the case of dwelling-houses, two storeys in height, and, in the case of all other residential occupancy-units and all business, com-

mercial or industrial occupancies, exceeding one storey in height;

Class 8.—Storage occupancy-units not exceeding one storey or 10,5 metres in height, but exceeding 6 metres in height, but excluding units for the storage of flammable liquids and substances, as provided for in section 44.

(4) *Grade C construction.*—Every occupancy-unit which falls into one or other of the following two classes shall be erected in accordance with the requirements specified in this Chapter for grade C construction—

Class 9.—Business, commercial or industrial occupancy-units not exceeding one storey in height;

Class 10.—Storage occupancy-units not exceeding one storey or 6 metres in height or 7 000 cubic metres in capacity, but excluding units for the storage of flammable liquids and substances, as provided for in section 44.

(5) *Grade D construction.*—Every occupancy-unit which falls into the following class shall be erected in accordance with the requirements specified in this chapter for grade D construction—

Class 11.—Dwelling-houses not exceeding two storeys in height.

(6) Nothing contained in this section shall be construed as prohibiting the erection of a particular occupancy-unit which complies with the requirements of a higher grade of construction than that under which such occupancy-unit falls in terms of this section, and, if a unit is so constructed, the cubic capacity of such occupancy-unit may be increased to that applicable to such higher grade of construction, as set out in section 6.

(7) Where there is any doubt or dispute as to the grade of construction or the fire-load category into which an occupancy-unit falls, the decision of the local authority shall be final.

SEPARATION OF OCCUPANCY-UNITS AND TENANCY-UNITS

5. (1) Except as provided in subsection (3), every occupancy-unit and every portion of an occupancy-unit occupied by a separate tenant shall be separated by means of an occupancy-separation structure or a tenancy-separation structure, as the case may be, complying with section 13, from any adjoining occupancy-unit or portion thereof, as the case may be.

(2) Except as provided in subsection (3), where there are several occupancy-units in a building, all of which do not have the same occupancy, each such occupancy-unit shall comply with the requirements of this Chapter applicable to it.

(3) The provision of occupancy-separation structures between different occupancy-units comprised in one building, as set out in subsection (1), may be omitted between such occupancy-units as are in one tenancy, if all such occupancy-units comply with the requirements of this Chapter which are applicable to that occupancy-unit included in them which requires the most stringent precautions.

MAXIMUM CUBIC CAPACITY OF DIVISIONS

6. (1) All buildings with a capacity greater than is permitted for a division under Table I shall be subdivided into divisions, and no such division shall have a greater cubic capacity than is permitted in that Table.

(2) Such cubic capacity may be measured exclusive of the thickness of the containing walls or floor-slabs, and exclusive also of the whole roof construction, including the ceiling, where this construction is constructed of non-combustible material.

(3) Where part of the roof construction, including the ceiling, is constructed of combustible material, the volume of the whole roof construction shall be included in assessing the volume of the division.

(4) The cubic capacities specified in column 3 of Table I for single-storey buildings without basements, or divisions without basements, may be doubled in the case of buildings or divisions provided with an approved sprinkler system throughout the building or division, or with the approval of the local authority an alternative automatic extinguishing system, and, in the case of buildings or divisions of grade A construction, having low or moderate fire-load, which are so provided, such capacity may be unlimited.

(5) The cubic capacities specified in column 4 of Table I for multi-storey buildings may be increased at the discretion of the local authority, under such conditions as the local authority may prescribe, in the case of buildings or divisions provided with an approved sprinkler system throughout the building or division, or with the approval of the local authority an alternative automatic extinguishing system.

(6) Notwithstanding the particular requirements of sections 8 and 9, it shall be permissible to use unprotected steel columns and beams in any single-storey building or division of a building referred to in subsection (1) which is wholly used for any of the following occupancies—

(a) business, commercial or industrial occupancy of low or moderate fire-load;

(b) storage occupancy, having a low or moderate fire-load;

(c) public and assembly occupancy in which—

(i) category A, mentioned in column 5 of Table I, shall include occupancies for theatres, cinemas, cafés and exhibition-buildings; and

(ii) category B, mentioned in column 5 of Table I, shall include class-rooms, club-rooms, clinics and places of worship;

both categories having a population not exceeding 300.

(7) In Table I, construction referred to in subsection (6) is termed "unprotected steelwork construction", and all other construction is termed "fire-protected construction".

TABLE I
MAXIMUM CUBIC CAPACITIES OF BUILDINGS OR DIVISIONS

1	2	3	4	5
Occupancy and fire-load of building or division	Maximum cubic capacity of building or division, in cubic metres for—			
	Fire-protected construction			Unprotected steelwork construction
	Construction grade	Single storey, without basement	Multi-storey	Single storey, without basement
Residential, institutional, public and assembly, business, commercial or industrial, all of low fire-load	A	42 000*	14 000	Business, commercial and industrial: 14 000
	B	21 000	7 000	
	C	14 000	Not permitted	Public and assembly: 1 400 for category A; 4 200 for category B
Industrial or commercial, of moderate fire-load	A	35 000*	10 500	7 000
	B	14 000	5 250	
	C	10 500	Not permitted	
Industrial or commercial, of high fire-load	A	28 000	7 000	Not permitted
	B	10 000	2 800	
	C	7 000	Not permitted	
Storage, with low or moderate fire-load	A	28 000*	7 000	7 000
	B	14 000	3 500	7 000
	C	7 000	Not permitted	7 000
Storage, with high fire-load (other than as provided for in section 44)	A	14 000	4 200	Not permitted
	B	7 000	2 100	
	C	3 500	Not permitted	

* Unlimited, if approved sprinkler system or approved alternative automatic extinguishing system is installed.

PARTICULAR REQUIREMENTS FOR GRADE A CONSTRUCTION

7. (1) Grade A construction means construction complying with the particular requirements of this section.

(2) *Structural members.*—Except as otherwise provided in subsection (5), all structural members in buildings shall be of non-combustible materials, and all such members shall have fire-resistance ratings of not less than the ratings specified in Table II.

TABLE II
FIRE-RESISTANCE RATINGS OF STRUCTURAL MEMBERS FOR GRADE A CONSTRUCTION

1	2	3	4
Structural members	Fire-resistance rating, in hours, for:		
	Class 1 occupancy-units	Classes 2–5 occupancy-units	
		Low or moderate fire-load	High fire-load
Bearing-walls, columns and beams	2	1½	2
Division-walls and suspended division-floors complying with section 12	4	4	4
Other suspended floors .	2	1½	2

(3) *External non-bearing-walls.*—All external non-bearing-walls of a building, which are within the distances from the nearest lateral boundary of the stand on which such building is erected or from another building on such stand, specified in column 1 of Table III, shall have fire-resistance ratings of not less than the corresponding rating specified in column 2 of that Table.

TABLE III
FIRE-RESISTANCE RATINGS OF EXTERNAL NON-BEARING-WALLS FOR GRADE A CONSTRUCTION

1	2
Distance of wall from the nearest lateral boundary or another building on the same stand, in metres	Minimum fire-resistance rating, in hours
Less than 1,5	1½
1,5–3	1
Over 3	½

(4) *Covering to the surface of external walls.*—Any covering to the exterior surface of external walls shall be of non-combustible materials:

Provided that timber or other combustible material, to an extent not exceeding 20 *per centum* of the superficial area of openings formed for show-

windows, may be used for such openings up to the ceiling-level of the ground storey or to a height of 6 metres above finished ground-level, whichever is the lower.

(5) *Suspended floors and floor finishes of combustible materials.*—Suspended floors or floor finishes of timber or other combustible material shall not be permitted, except for—

(a) the floor of any stage or platform, if the space beneath such floor is not used for storage purposes;

(b) sprung floors if—

(i) such floors are supported on a base having the appropriate fire-resistance rating for suspended floors, as specified in columns 2, 3 and 4 of Table II; and

(ii) no portion of such floors is more than 450 millimetres above such base;

(c) the finishes or wearing-surfaces of floors having non-combustible bases, but not in rooms in which flammable substances are stored.

(6) *Roof assemblies.*—Every roof assembly in any occupancy-unit which falls into class 1 shall have a fire-resistance rating of not less than one hour, and every other roof assembly shall have a fire-resistance rating of not less than half an hour.

(7) Combustible material shall not be used as roof-covering, except that, where the roof construction is of concrete or other non-combustible construction, bituminous felt or other approved combustible material may be used to cover such construction.

(8) *Roof-spaces.*—Every roof-space between a ceiling and a sloping roof which would otherwise exceed in plan area, measured at ceiling-level, the area set out in column 2 of Table IV shall be subdivided by walls acting as draught-stops into sections, each having a plan area not exceeding the area aforesaid, and such subdividing-walls shall not be farther apart than the distance set out in column 3 of that Table.

TABLE IV

REQUIRED SUBDIVISION OF CEILING-ROOF SPACE FOR GRADE A CONSTRUCTION

1	2	3
Occupancy	Maximum plan area contained between subdividing-walls acting as draught-stops, in square metres	Maximum distance between subdividing-walls acting as draught-stops, in metres
Residential . .	180	15
Other than residential . .	270	30

(9) Subdividing-walls acting as draught-stops shall be of brick with a crushing strength of at least 10 megapascals and class C mortar, as specified in Chapter 5, and of not less than 100 millimetres in thickness:

Provided that, if their length exceeds 10,5 metres or their height above ceiling-level exceeds 1,4 metres, they shall be not less than 215 millimetres in thickness, and be laid in English bond or Flemish bond.

(10) Every subdividing-wall shall be taken up to the underside of the roof-covering for the full thickness of the wall, and shall comply with the relevant requirements for an occupancy-separation structure, as set out in section 13.

(11) Every roof-space formed by a sloping, pitched or saw-tooth roof which—

(a) is not separated from the space immediately below by a ceiling; and

(b) would otherwise cover a plan area exceeding 500 square metres;

shall be subdivided, by means of approved suspended roof-space partitions of incombustible material having a fire-resistance rating of not less than half an hour, into sections, each of which covers a plan area not exceeding 500 square metres.

(12) The roof-space partitions shall be taken close to the underside of the roof-covering, so as to allow no air passage between partition and roof, and shall extend down to the level of the top of the walls or to the bottom of the tie-beams, girders or other roof construction, whichever is the lower.

(13) Approved automatic ventilation-openings shall be provided in every such subdivision of a roof-space, and in every such subdivision formed by the roof construction.

(14) *Partition-walls.*—Every partition-wall shall be of non-combustible material in the following cases—

(a) in all basements;

(b) in all storeys of occupancy-units of class 1; and

(c) in all occupancy-units of high fire-load.

(15) Every partition-wall in locations other than those specified in subsection (14) shall be of non-combustible material, or shall be of timber or other framing covered on both sides with material graded as class 1 in the Third Schedule.

(16) Every doorway in partition-walls in basements shall be fitted with a fire-door having a fire-resistance rating of not less than half an hour.

(17) *Interior trim and finishes.*—The use of combustible material for trim to door- and window-frames, and for skirtings and chair- and picture-rails shall be permitted, if such trim and finishes are backed solidly with non-combustible material.

(18) *Interior wall-linings.*—Any interior wall-linings in a class 1 occupancy-unit shall be of non-combustible materials.

(19) Any interior wall-linings in rooms used for sleeping purposes in classes 2, 3 and 4 occupancy-units shall be of material graded as class 1 in the Third Schedule.

(20) Interior wall-linings applied to walls other than those specified in subsections (18) and (19) may be of combustible material, if such walls are of masonry or of concrete.

PARTICULAR REQUIREMENTS FOR GRADE B CONSTRUCTION

8. (1) Grade B construction means construction complying with the particular requirements for this section.

(2) *Structural members.*—Except as otherwise provided in subsections (3) and (5), all structural members shall have fire-resistance ratings of not less than the ratings specified in Table V.

TABLE V

FIRE-RESISTANCE RATINGS OF STRUCTURAL MEMBERS FOR GRADE B CONSTRUCTION

1	2	3
Structural members	Fire-resistance rating, in hours, for	
	Low or moderate fire-load	High fire-load
Bearing-walls, columns and beams	1	1½
Division-walls and suspended division-floors complying with section 12	4	4
Other suspended floors	1	1½

(3) *External walls and external members.*—External bearing-walls and non-bearing-walls and external members of structural frames of a building, which are within the distances from the nearest lateral boundary of the stand on which such building is erected or from another building on such stand, specified in column 1 of Table VI, shall have fire-resistance ratings of not less than the corresponding rating specified in column 2 of that Table.

TABLE VI

FIRE-RESISTANCE RATINGS OF EXTERNAL WALLS AND EXTERNAL MEMBERS OF STRUCTURAL FRAMES FOR GRADE B CONSTRUCTION

1	2
Distance of wall or member from the nearest lateral boundary or another building on the same stand, in metres	Fire-resistance rating, in hours
Less than 1,5	1½
1,5–3	1
Over 3	½

(4) *Covering to the surface of external walls.*—Any covering to the exterior surface of external walls shall be of non-combustible materials:

Provided that timber or other combustible material, to an extent not exceeding 30 *per centum* of the superficial area of openings formed for show-windows may be used for such openings up to ceiling-level of the ground storey, or to a height of 6 metres above finished ground-level, whichever is the lesser.

(5) *Suspended floors.*—Suspended floors of timber or other combustible material shall not be permitted except for—

(a) the floor of any stage or platform, if the space beneath such floor is not used for storage purposes;

(b) floors on the ground storey of any building, if no part of the space under such floors is used for other than floor-inspection purposes; and

(c) sprung floors if—

(i) such floors are supported on a base having the appropriate fire-resistance rating for suspended floors, as specified in columns 2 and 3 of Table V; and

(ii) no portion of such floors is more than 450 millimetres above such base.

(6) *Roof assemblies.*—Every roof assembly shall have a fire-resistance rating of not less than half an hour.

(7) Combustible material shall not be used as exterior covering to such roof assembly:

Provided that, where the roof construction is of concrete or other non-combustible construction, bituminous felt or other approved combustible material may be used to cover such roof construction.

(8) Every roof-space in a sloping roof having a ceiling shall comply with the relevant requirements of subsections (8) and (9) of section 7.

(9) *Partition-walls.*—Every partition-wall in a basement shall be of non-combustible material.

(10) Every partition-wall in a storey above the ground storey in auditoria, bowling-alleys, dance-halls, colleges and schools, both residential and non-residential shall be of—

(a) non-combustible materials; or

(b) timber or other framing covered on both sides with a material graded as class 1 in the Third Schedule.

(11) All partition-walls, other than those described in subsections (9) and (10), shall be of—

(a) non-combustible materials; or

(b) timber or other framing covered on both sides with a material graded not lower than class 3 in the Third Schedule.

(12) Every doorway in partitions in basements shall be fitted with a fire-door having a fire-resistance rating of not less than half an hour.

(13) *Interior trim and finishes.*—The use of combustible material shall be permitted for trim to door- and window-frames, and for skirtings and chair- and picture-rails, if such trim and finishes are backed solidly with non-combustible material.

(14) *Interior wall-linings.*—Any interior wall-linings in rooms used for sleeping purposes shall be of material graded as class 1 in the Third Schedule.

(15) Any interior wall-linings, other than linings applied to walls of required exit-ways and of rooms used for sleeping purposes, may be of combustible material, if such walls are of masonry or concrete.

PARTICULAR REQUIREMENTS FOR GRADE C CONSTRUCTION

9. (1) Grade C construction means construction complying with the particular requirements of this section.

(2) *Structural members.*—Except as otherwise provided in subsections (3) and (4), all structural members shall have fire-resistance ratings of not less than the following—

(a) occupancy-units with high fire-load, one hour;

(b) occupancy-units with moderate fire-load, half an hour; and

(c) occupancy-units with low fire-load, no requirement.

(3) *External walls and external members of structural frames.*—External walls and external members of structural frames of a building which are within the distances from the nearest lateral boundary of the stand on which such building is erected or from another building on such stand, specified in column 1 of Table VII, shall have fire-resistance ratings or fire protection, as the case may be, not less than the appropriate rating or protection specified in column 2 of that Table.

TABLE VII

FIRE-RESISTANCE RATINGS AND FIRE PROTECTION FOR EXTERNAL WALLS AND EXTERNAL MEMBERS OF STRUCTURAL FRAMES FOR GRADE C CONSTRUCTION

1	2
Distance of wall or member from the nearest lateral boundary or another building on the same stand, in metres	Fire-protection requirements
Less than 1,5	1½-hour fire-resistance rating, and to be of non-combustible materials
1,5–3	1-hour fire-resistance rating, and to be of non-combustible materials
More than 3, but less than the relevant distance set out in column 2 of Table IX	½-hour fire-resistance rating, and to be protected externally with approved non-combustible material
Not less than the relevant distance set out in column 2 of Table IX, but less than that set out in column 3 of that Table	To be protected externally with approved non-combustible material

(4) Where, in consequence of additions, any external wall of an existing building will be at a lesser distance from the nearest lateral boundary or from another building on the same stand than is required for the increased floor area of the ground storey set forth in Table IX resulting from such additions, such wall shall be permitted to remain in its existing position, if every external wall or external structural frame which is a part of such additions is erected in accordance with the requirements set out in Table VIII below.

TABLE VIII

REQUIREMENTS FOLLOWING ON ERECTION OF CERTAIN ADDITIONS

Conditions	Minimum distance of external wall or external structural frame which is a part of the additions from the nearest lateral boundary or another building on the same stand
Where additions to a building increase the floor area of the ground storey of such building by not more than 100 *per centum* or increase by not more than 50 *per centum* the length of any existing external wall or external structural frame of such building, which said wall or frame faces the nearest lateral boundary or faces another building on the same stand	As required in terms of Table IX for a building of the increased floor area of the ground storey
Where additions to a building increase the floor area of the ground storey of such building by more than 100 *per centum*, or increase by more than 50 *per centum* the length of any existing external wall or external structural frame of such building, which said wall or frame faces the nearest lateral boundary or faces another building on the same stand	600 millimetres more than required, in terms of Table IX, for a building of the increased floor area of the ground storey

(5) Subject to the requirements of subsection (7), the distance between any external wall or external structural frame of a building which is of combustible construction and the nearest lateral boundary of the stand on which such building is erected, or between such wall or member and another building on the same stand, shall be not less than that specified in Table IX, in which such walls or frames are placed in the following classes—

Class A.—External walls or external structural frames of combustible construction protected externally with approved non-combustible material; and

Class B.—External walls or external structural frames of combustible construction not falling into class A.

TABLE IX

BOUNDARY OR SEPARATION DISTANCES FOR EXTERNAL WALLS OR EXTERNAL MEMBERS OF STRUCTURAL FRAMES OF A BUILDING WHICH ARE COMBUSTIBLE—GRADE C CONSTRUCTION

1	2	3
Ground-storey area of building, in square metres	Distance to nearest lateral boundary or another building on the same stand, in metres	
	Class A	Class B
Up to 1 000	3,6	6,0
1 001–2 000	4,2	7,5
Over 2 000	4,8	9,0

(6) *Floors.*—All floors shall have a fire-resistance rating of not less than half an hour, and all floors constructed directly over basements shall be of non-combustible materials, but this shall not prohibit the use of combustible material as a floor finish.

(7) *Roof assemblies.*—No roof of a building shall be covered with thatch or wooden shingles:

Provided that a building not exceeding 1 400 cubic metres in capacity and having walls of non-combustible materials and a low fire-load may have a roof covered with thatch or wooden shingles if—

(a) such building is not less than 10 metres from any boundary whatsoever of the stand on which such building is to be erected; and

(b) such building complies with the relevant requirements of subsections (8) to (11) of section 10.

(8) The covering of all roofs of buildings having high or moderate fire-load occupancy-units shall be of non-combustible materials:

Provided that, where a roof construction is of concrete or other non-combustible construction, bituminous felt or other approved material may be used to cover such roof construction.

(9) All roof-members in buildings having a high fire-load shall be separated from the room or rooms below such members by a ceiling construction or other protection having a fire-resistance rating of not less than half an hour.

(10) *Partition-walls.*—Every partition-wall in a basement shall be of non-combustible material, and every doorway in such partition-wall shall be fitted with a fire-door having a fire-resistance rating of not less than half an hour.

PARTICULAR REQUIREMENTS FOR GRADE D CONSTRUCTION

10. (1) Grade D construction means construction complying with the particular requirements of this section.

(2) *Walls and structural frames.*—All external walls which have roofs covered with thatch or wooden shingles shall be of non-combustible materials, and, except where otherwise provided in subsection (3), all bearing-walls or structural frames shall have a fire-resistance rating of not less than half an hour.

(3) *External walls and external members of structural frames.*—Non-combustible external bearing-walls and non-bearing-walls and external members of structural frames of a building shall comply with the requirements of subsection (3) of section 9.

(4) Subject to the requirements of subsection (9), the distance between any external wall or structural frame of combustible construction of an occupancy-unit falling under class 11 and another building on the same stand, or between such wall or frame and the nearest lateral boundary of such stand, shall be not less than the distance specified in Table X, in which such walls or frames are placed in the following classes of construction—

Class A.—External walls or external structural frames of combustible construction protected externally with approved non-combustible material; and

Class B.—External walls or external structural frames of combustible construction not falling into class A.

TABLE X

BOUNDARY OR SEPARATION DISTANCES FOR EXTERNAL WALLS OR EXTERNAL MEMBERS OF STRUCTURAL FRAMES OF A BUILDING WHICH ARE COMBUSTIBLE—GRADE D CONSTRUCTION

1	2	3
Floor area of the ground storey of building, in square metres	Distance to nearest lateral boundary or another building on the same stand, in metres	
	Class A	Class B
Up to 60	2,7	5,1
61–150	3,6	6,7
151–215	4,2	7,9
Over 215	4,5	8,7

(5) *Floors.*—All floors of rooms constructed in the roof-space of any building having a roof covered with thatch or wooden shingles shall be of non-combustible materials having a fire-resistance rating of not less than half an hour.

(6) All floors constructed directly over basements shall have a fire-resistance rating of not less than one hour.

(7) All floors, other than those referred to in subsections (5) and (6), shall have a fire-resistance rating of not less than half an hour:

Provided that no fire-resistance rating shall be required for such floors in the ground storey, if the space beneath such floors is not used for storage purposes.

(8) *Roof assemblies.*—The roof of every building having external walls of combustible construction shall be covered with non-combustible materials.

(9) Every building having a roof covered with thatch or wooden shingles shall be not less than 10

metres from any boundary whatsoever of the stand upon which such building is to be erected.

(10) All metal used in the attachment of thatch to the roof-members shall be bonded to earth.

(11) All telephone and electricity supply-lines shall be brought by means of underground conduits or cables into every building which has a thatched roof.

(12) *Partition-walls.*—Every partition-wall in a basement shall be of non-combustible materials. Every doorway in such partition-wall shall be fitted with a fire-door having a fire-resistance rating of not less than half an hour.

(13) *Garages.*—Every floor separating the remainder of the building from a garage shall be regarded as forming part of an occupancy-separation structure, which shall comply with the requirements of section 43 and shall have no openings whatever therein.

(14) Every wall separating the remainder of the building from a garage shall comply with the requirements for an occupancy-separation structure set out in section 43, except that any doorway in such wall shall be fitted with a self-closing door constructed to have a fire-resistance rating of not less than half an hour, and every such doorway shall have a solid stone or concrete threshold raised at least 100 millimetres above the floor of the garage.

PART II

GENERAL REQUIREMENTS FOR ALL BUILDINGS

FIRE-RESISTANCE RATING OF SUPPORTING STRUCTURAL MEMBERS

11. All supporting structural members in buildings shall have a fire-resistance rating of not less than the required rating of the construction supported by such members.

DIVISION-WALLS AND DIVISION-FLOORS

12. (1) Where a building is divided into divisions, as required by section 6, all division-walls and division-floors shall comply with the requirements of this section.

(2) *Fire-resistance rating.*—Every division-wall and every suspended floor which is a division-floor shall be of non-combustible material, and shall have a fire-resistance rating of not less than four hours.

(3) Every division-wall shall be constructed as a continuous wall, or as a number of storey-to-storey walls, not necessarily in one vertical plane:

Provided that, where such walls are not in one vertical plane, the floor construction connecting such walls shall have a fire-resistance rating of not less than four hours.

(4) Every division-wall, whether continuous or not, shall—

(a) rest on a construction having a fire-resistance rating of not less than four hours; and

(b) extend to not less than 300 millimetres above the roof-covering:

Provided that, in the following cases, such wall need only be carried up against the underside of the roof-covering, for the full thickness of the wall—

(a) where the roof construction is non-combustible, and collapse thereof on one side of the wall would not endanger the stability of such wall;

(b) where the difference in the height of the roofs of divisions of a building exceeds 1 metre at the division-wall, and the roof construction is non-combustible.

(5) Division-floors shall be continuous over the area of the division, except for openings enclosed, as set out in subsection (9).

(6) *Openings in division-walls.*—Openings in any division-wall shall not exceed 12 square metres in area, and shall have no dimension greater than 3,6 metres.

(7) The aggregate width of all such openings at any storey-level shall not exceed 25 *per centum* of the length of the wall in which such openings are formed.

(8) Every opening in a division-wall shall be protected by an approved automatic or self-closing fire-door or fire-shutter, and the aggregate fire-resistance rating of the door or shutter shall be not less than four hours:

Provided that, where such opening occurs in the walls between two buildings, a door or fire-shutter shall be required on each side of the walls.

(9) *Openings in division-floors.*—Every opening in a division-floor shall be protected by an enclosed shaft, and any opening in such shaft shall be fitted with an approved automatic or self-closing fire-door or fire-shutter, and the enclosing-walls and such door or shutter shall have a fire-resistance rating of not less than one and a half hours.

(10) *Protection of openings in external walls at division-floors.*—Where a division-floor abuts external walls, the risk of the passage of fire past such floor shall be reduced by protecting the openings hereinafter referred to in such walls by non-opening or self-closing fire-windows or shutters, or self-closing fire-doors, having a fire-resistance rating of not less than half an hour, so disposed that every opening within a horizontal band of the external walls of not less than 7,5 metres in height is so protected, and such band shall overlap the division-floor and be situated above, below or partly above and partly below the division-floor:

Provided that the openings in such external walls need not be protected, as prescribed above, if a canopy or hood of non-combustible material having a fire-resistance rating of not less than one hour is constructed as an extension of the division-floor to project not less than 1,5 metres beyond the exterior face of the external wall abutting the division-floor.

(11) If a canopy or hood is constructed, as in the proviso to subsection (10), such canopy or hood shall be provided under every opening in such wall, within a height of 7,5 metres above the division-floor, and

shall extend not less than 1,5 metres beyond the vertical lines drawn through the sides of every such opening.

OCCUPANCY-SEPARATION STRUCTURES AND TENANCY-SEPARATION STRUCTURES

13. (1) Occupancy-separation structures and tenancy-separation structures shall comply with the requirements of this section.

(2) *Fire-resistance ratings.*—All occupancy-separation structures shall be constructed of non-combustible material, and such occupancy-separation structures and all tenancy-separation structures shall have fire-resistance ratings of not less than the ratings specified in Table XI.

TABLE XI

FIRE-RESISTANCE RATINGS OF OCCUPANCY-SEPARATION STRUCTURES AND TENANCY-SEPARATION STRUCTURES

1	2
Description of structure	Fire-resistance rating; in hours
Occupancy-separation structure separating an occupancy-unit of high fire-load from one of high, moderate or low fire-load	4
Occupancy-separation structure separating an occupancy-unit of moderate or low fire-load from one of moderate or low fire-load	2
Occupancy-separation structure separating dwelling-units in a block of flats or maisonettes, or dwelling-houses in semi-detached dwellings or houses in a terrace	2
Tenancy-separation structure	1

(3) *Construction of occupancy-separation structures.*—Every wall of an occupancy-separation structure shall extend from a foundation or floor of non-combustible construction to a ceiling or floor of non-combustible construction:

Provided that, where a ceiling is of combustible material, such wall shall extend through such ceiling to a non-combustible floor or roof construction and, where the roof is of combustible construction, such wall shall be carried through such roof to not less than 300 millimetres above the covering of such roof.

(4) Suspended floors in an occupancy-separation structure shall be continuous over the area of the occupancy-unit concerned, except for openings protected, as set out in subsection (6).

(5) *Openings in occupancy-separation structures.*—Every wall of an occupancy-separation structure shall have no openings other than doorways, and every such doorway shall be fitted with an approved self-closing fire-door having the appropriate fire-resistance rating set forth in Table XI.

(6) Every opening in the floor of an occupancy-separation structure shall be protected by an enclosed shaft, and any opening in such shaft shall be fitted with an approved self-closing fire-door or shutter, and such shaft shall have a fire-resistance rating of one and a half hours, and such door or shutter shall have a fire-resistance rating of one hour.

(7) *Penetration of occupancy-separation structure walls by combustible materials.*—No combustible material shall pass through an occupancy-separation structure wall:

Provided that—

(i) rafters, joists, bearers and beams of combustible materials may be built into such wall, if the remaining thickness of the wall has the appropriate fire-rating set out in Table XI; and

(ii) light, combustible roof-members, such as battens and purlins, may be built into such wall, if such members are separated from one another by non-combustible material of not less than 75 millimetres in width and of a depth of not less than the depth of such members.

OPENINGS IN EXTERNAL WALLS

14. (1) Places of worship not exceeding three storeys in height, dwelling-houses and open-air parking-garages shall be excluded from the provisions of this section.

(2) In this section, "opening" shall mean any portion of an external wall which has a lower fire-resistance rating than that prescribed in this Chapter for such wall, but shall not include any window, less than 0,5 square metre in area which serves a water-closet, bath-room or cloak-room:

Provided that, if any two or more windows are not separated from one another by a horizontal distance of at least 215 millimetres or a vertical distance of at least 1,2 metres, they shall be regarded as one opening.

(3) The fire protection of openings in an external wall of a building shall be as set forth in Table XII, when the distance from such an opening to the nearest lateral boundary of the stand on which such building is erected, or to another building on the same stand is the relevant distance set out in that Table:

Provided that such protection need not be provided to openings facing a lateral boundary, if there is erected on such boundary a baffle-wall having a fire-resistance rating of not less than one and a half hours, and of such a height and length as will, in the opinion of the local authority, render the protection of such openings unnecessary.

(4) Where an external wall of one building is built against an external wall of another building, and an opening is formed in both such walls so as to provide means of access between such buildings, the opening so formed shall be deemed to be an opening in a division-wall, and such opening shall be protected on each side of such composite wall by approved fire-doors or fire-shutters having an aggregate fire-resistance rating for both doors or both shutters of not less than four hours.

(5) Any opening formed in an external wall of a building, which opening is within the range of dis-

tances from the nearest lateral boundary of the stand on which such building is erected or from another building on the same stand set out in column 2 of Table XII, shall be fitted with an approved automatic or a self-closing fire-door or fire-shutter having a fire-resistance rating of not less than one and a half hours.

(6) Any opening formed in an external wall of a building, which opening is within the range of distances from the nearest lateral boundary of the stand on which such building is erected or from another building on the same stand set out in columns 3 and 4 of Table XII, shall be fitted with an automatic or a self-closing fire-door or fire-shutter having a fire-resistance rating of not less than one hour.

(7) Any opening formed in an external wall of a building, which opening is within the range of distances from the nearest lateral boundary of the stand on which such building is erected or from another building on the same stand set out in columns 5 and 6 of Table XII, shall be fitted with an approved non-openable or self-closing fire-window or with an approved automatic or self-closing fire-door or fire-shutter, and every such window, door or shutter shall have a fire-resistance rating of not less than half an hour.

(8) Any external wall of a building, in which the total area of openings or the total use of combustible exterior wall-lining exceeds 55 *per centum* of the area of such wall, shall be not less than 9 metres from any lateral boundary of the stand on which such building is erected or from another building on the same stand and facing such wall, and not less than 6 metres from the centre-line of any street exceeding 4,5 metres in width.

(9) The distances referred to in the foregoing subsections shall be taken as the least distance between the opening or the wall, as the case may be, and the nearest lateral boundary or building concerned.

(10) Subject to the provisions of subsection (10) of section 12, any opening which is located vertically above or below another opening in an external wall and which is not protected by a fire-shutter or fire-door or a fire-window shall be—

(a) separated by a vertical distance of not less than 1,2 metres from such other opening; or

(b) protected by a hood or canopy under the opening, projecting not less than 1 metre from the wall-face, and projecting not less than 1 metre beyond the vertical lines drawn through the sides of every such opening.

(11) If a hood or canopy is constructed in accordance with the provisions of paragraph (b) of subsection (10), such hood or canopy shall be of non-combustible material and shall have a fire-resistance rating of not less than one hour.

SERVICE-SHAFTS

15. (1) The provisions of this section shall not apply to shafts in dwelling-houses or to shafts enclosing stairways, air-ducts, incinerator-chutes, flues and ramps connecting storeys in buildings.

(2) All lift-shafts and hoist-shafts in a building shall be enclosed by walls having a fire-resistance rating of not less than one and a half hours. In such shafts, there shall be at least one opening in every 9 metres of the height of the shaft, fitted with an approved self-closing fire-door having a fire-resistance-rating of not less than one hour.

(3) Any enclosed shaft extending through the roof, and which is enclosed at the top, shall be provided with a lantern-light having unglazed or glazed openings equivalent in area to not less than 20 *per centum* of the cross-sectional area of such shaft, and, where such openings are glazed, they shall be glazed

TABLE XII

FIRE PROTECTION OF OPENINGS IN EXTERNAL WALLS REQUIRED IN RELATION TO DISTANCE

1	2	3	4	5	6	7
Class or grade of construction of building	Where the distance to lateral boundary or another building on the same stand is as shown, requirements for openings in walls shall be as shown in the headings to columns 2–7 set out below:					
	Only doorway openings; all such openings to be fitted with fire-doors or fire-shutters complying with subsection (5)	Area of each opening not to exceed 5 square metres				No requirement
		All openings to be fitted with fire-doors or fire-shutters complying with subsection (6)		All openings to be fitted with fire-windows, fire-doors or fire-shutters complying with subsection (7)		
	Least distance, in metres					
	less than	not less than,	but less than	not less than,	but less than	not less than
Class 1, and the storage contemplated by section 44	4,5	4,5	6,0	6,0	7,5	7,5
Other buildings (all grades of construction of high fire-load)	3,0	3,0	3,75	3,75	4,5	4,5
Other buildings (all grades of construction of moderate or low fire-load)	1,5	1,5	2,25	2,25	3,0	3,0

with plain glass of not more than 3 millimetres in thickness:

Provided that instead of such lantern-light, a window glazed with similar glass and of equal area placed in the side of such shaft may be provided if—

(a) the sill of such window is not less than 600 millimetres above the roof-covering at any point of the sill; and

(b) such window is not within 3 metres of a lateral boundary.

(4) Any shaft enclosure which does not extend through the roof shall have the top of such enclosure enclosed by a construction having a fire-resistance rating of not less than that of the walls of the shaft, and shall be provided with a ventilating-duct leading to the outside air.

(5) The ventilating-duct referred to in subsection (4) shall have a cross-sectional area equal to not less than 10 *per centum* of the cross-sectional area of the shaft, and the discharge-end of such duct may be glazed with plain glass not exceeding 3 millimetres in thickness.

(6) Any shaft which does not extend to the bottom of a building shall be enclosed at its lowest point by a floor construction having a fire-resistance rating of not less than that of the walls of the shaft.

(7) Any room containing machinery for operating lifts shall be separated from the lift-shaft concerned by a construction having a fire-resistance rating of not less than two hours.

(8) Every doorway in a room containing machinery for operating lifts shall be fitted with an approved self-closing fire-door having a fire-resistance rating of not less than one hour.

ROOF-LIGHTS AND FLOOR-LIGHTS

16. (1) All frames and sashes of skylights, lantern and other similar lights shall be of metal:

Provided that, where such roof-lights are constructed—

(a) in dwelling-houses; or

(b) in localities where the roof-lights would be exposed to agencies deleterious to metal;

the local authority may permit the frames and sashes to be made of some other suitable material.

(2) All lights referred to in subsection (1) which are—

(a) less than 3 metres from a lateral boundary or an exit-way, and such lights which are inclined at an angle of less than 60 degrees to the horizontal shall be glazed with wired glass of not less than 6 millimetres in thickness; and

(b) in positions other than those described in paragraph (a), may be glazed with plain glass.

(3) Every skylight which is glazed with plain glass shall be protected by a substantial wire screen, with wire not lighter than 2,5 millimetres and having a mesh not greater than 15 millimetres, placed not less than 100 millimetres or more than 250 millimetres above the glazed portion of the skylight at all points.

(4) Such screen shall extend beyond the glazing on all sides for a distance of not less than the height of the screen above the glazing.

(5) Where a skylight or lantern-light is located over a stairway, exit-way or an indoor public and assembly occupancy, a similar screen shall also be placed below such skylight or lantern-light.

(6) Notwithstanding any other provision of this section, but subject to the approval of the local authority, roofs may be covered with materials made of incombustible or self-extinguishing plastics or other similar materials up to 10 *per centum* of the total roof area.

(7) Floor-lights of glass or other translucent and brittle material shall not be allowed in floors between the storeys of a building, unless they have a fire-resistance rating equal to that of the floor in which they are contained and comply with any other requirements of these by-laws relating, amongst others, to artificial lighting.

ACCESS TO ROOF-SPACES

17. (1) Any opening which gives access to a roof-space in a sloping-roof assembly through a ceiling, or through a subdividing-wall in such roof-space, shall be fitted with a non-secured cover or door having a fire-resistance rating of not less than that of the ceiling in the roof assembly concerned.

(2) Such cover or door shall be so constructed that it will remain closed when not in use.

(3) The size of such opening shall be not greater than 1 × 1 metre and not less than 600 × 750 millimetres.

SERVICE-PIPES AND EQUIPMENT SET IN STRUCTURAL MEMBERS

18. (1) *Fixing.*—Service-pipes, cables and other service equipment may be embedded in the fire-resistant protection to, and construction of, columns and other structural members if—

(a) after such equipment is fixed, such members still maintain the required fire-resistance rating and the thickness of fire-resistant protective covering, as laid down in Tables IV and V of the Second Schedule; and

(b) the service equipment is so fixed that the required fire-resistance rating of the member concerned is not impaired by any subsequent maintenance or replacement of such equipment.

(2) *Protection of fire-resistant protective covering.*—Where the fire-resistant protective covering to columns and other structural members is exposed to the risk of damage, as, for example, from vehicular traffic, or the handling of merchandise, such covering shall be protected by vertical guards or by wheel-guards or other approved means of protection.

FIRE-STOPPING

19. (1) Fire-stopping to the extent specified in this section shall be carried out with non-combustible material:

Provided that, in the case of walls and partitions of timber-frame construction, timber of not less than 38 millimetres in thickness may be used in fire-stops.

(2) *Spaces in fire-resistant protective coverings.*—Any spaces between the fire-resistant protective covering and columns or other structural members shall be fire-stopped at each storey level, and the fire-stops shall extend for the thickness of the floor of such storey.

(3) *Spaces in wood-floor construction.*—Where joists or bearers are parallel to, and are 75 millimetres or less from a wall or chimney, the space between the joist or bearer and the wall or chimney shall be fire-stopped to the depth of the joist or bearer.

(4) *Spaces between walls and wall-linings.*—In buildings of grade A construction, spaces between walls and wall-linings or panelling shall be completely fire-stopped.

(5) In buildings, other than buildings of grade A construction, such spaces shall be fire-stopped at each floor and ceiling-level.

(6) *Spaces in chases and recesses.*—Where chases or recesses pass from one storey to another, such chases or recesses shall be fire-stopped at each storey-level, and the fire-stops shall extend for the thickness of the floor of such storey.

(7) *Spaces around pipes and ducts.*—All spaces around pipes or ducts in every storey shall be fire-stopped at each floor, ceiling or wall of such storey.

(8) *Walls and partitions of stud-framing.*—All walls and partitions of stud-framing shall be fire-stopped at the floors and ceilings of every storey.

ACCESS FOR RESCUE AND FIRE-FIGHTING PURPOSES

20. (1) Every building, other than a single-storey building not exceeding 55 square metres in floor area, which does not have a frontage on to a street or public place, shall have access from such street or public place by means of an unobstructed passageway of not less than 3 metres in width, and having a clearance of not less than 4,2 metres in height.

(2) Similar access shall be provided from a street or public place to buildings exceeding three storeys in height which have no frontage on a street or public place, and such access shall lead to an open space adjoining the building of at least 4,5 metres in width and 12 metres in length.

(3) In any storey of any building above the ground storey in which all openings in any length exceeding 45 metres of a wall facing a street or public place or passageway referred to in subsection (1) are fitted with automatic fire-shutters or any other shutters which may bar entry from the outside, at least one shutter in every 45-metre length of such wall shall be readily openable from the outside, and shall bear an approved notice or mark clearly legible from such street, place or passageway.

(4) Where there is erected in front of any building facing a street or public place or passageway referred to in subsection (1) a screen or screen-wall which would otherwise bar entry to windows from the outside, there shall be provided, in such screen or screen-wall, openings of not less than 750 millimetres in width and of not less than 1,2 metres in height.

(5) At least one such opening shall be provided in every 45-metre length of such screen or screen-wall in every storey above finished ground-level, including the ground storey, up to and including the sixth storey.

(6) In any building or portion thereof in which there are no windows in the external walls, access openings shall be provided in such walls for fire-fighting purposes in each storey above finished ground-level, including the ground storey, up to and including the sixth storey.

(7) Such openings shall be not less than 750 millimetres in width and not less than 1,5 metres in height and have a sill not more than 1 metre above the inner floor-level of each storey, and shall be not more than 45 metres apart horizontally.

(8) Every such opening shall be fitted with a shutter readily openable from the outside, and shall bear an approved notice or mark clearly legible from the ground below.

(9) There shall be provided in every building, any storey of which is at a height of more than 20 metres above ground-level, at least one lift serving every such storey, and the following provisions shall apply—

(a) the electricity-supply to the lift shall be provided by an independent circuit; and

(b) the area of the platform of the lift shall be not less than 1,5 square metres, and the lift shall be capable of carrying a load of not less than 545 kilograms; and

(c) the lift shall be fitted with a fire-switch control system incorporating—

(i) a device which will enable firemen to take control of the lift without interference from landing call-points; and

(ii) a fire-switch positioned at the landing call-station at ground-floor level and housed in a glass-fronted lock-fast recessed box clearly marked in 50-millimetre lettering "FIRE-SWITCH";

and

(d) the entrance to the lift on each storey served by the lift shall be in—

(i) an open-access balcony or other permanently ventilated area; or

(ii) an approved smoke-lobby:

Provided that the provisions of sub-paragraph (ii) shall not apply to—

(a) a storey in a block of flats on which there is no entrance to any flat; or

(b) the topmost storey of a building—

(i) on which there is a fire-mains outlet provided; and

(ii) to which there is access by a stair serving also the storey below that storey; and

(iii) where the lift serving the storey next below that storey is distant from a door in the stairway enclosure of that stair by a horizontal distance of not more than 5 metres.

FIRE-ALARMS

21. Where, in the opinion of the local authority, there is need for public warning, in the event of the outbreak of fire, an automatic or manually operated approved fire-alarm system shall be installed, to the satisfaction of the local authority, for the purpose of arousing occupants in the event of the outbreak of fire.

PART III

EXIT-WAYS

ADMINISTRATIVE REQUIREMENTS FOR EXIT-WAYS

22. (1) Except as hereinafter provided in this Chapter, the provisions of sections 22 to 32 are general requirements which shall apply to every building in the local authority's area of jurisdiction.

(2) Where, in the opinion of the local authority, the means of escape, in the event of fire, from any building erected before the promulgation of this Chapter are inadequate, the local authority may serve a written order upon the owner of such building, calling upon him to carry out within a reasonable time, to be specified in such order, such measures, also to be specified in such order, as it may consider necessary to bring such building into conformity with the provisions of this Chapter relating to such means of escape.

(3) In any building to which the provisions of this Chapter apply, whether such building was erected before or after the adoption of this Chapter, the means of escape therefrom, including all exit-ways, panic-bolts, automatic devices, lights and other appliances in connexion with such means of escape, shall be maintained in a proper and safe condition and in proper working order, to the satisfaction of the local authority.

(4) No building shall be altered in such manner as to reduce the number or aggregate width of exit-ways from such building to less than is required by sections 23 to 26.

INDIVIDUAL EXIT-WAYS

23. (1) Every exit-way required by this Chapter shall consist of one or more of the components specified in subsection (5), arranged in a series, so that—

(a) each component in the series discharges directly into the next component without the necessity for passing through any room or through any division-wall, except a wall forming part of a stair-enclosure; and

(b) the last component in the series discharges directly through an exit into a street or public place or arcade of the width required by section 26.

(2) The width of any street or public place or arcade referred to in paragraph (b) of subsection (1) shall be not less than the required width of the exit from such exit-way, and in any case where two or more exit-ways from the same building discharge into the same street, public place or arcade, the width of such street, public place or arcade shall be not less than the combined required widths of the exits from such exit-ways:

Provided that, where a building is divided into two or more sections, each of which is completely cut off from the remainder by imperforate walls, floors and ceiling-floor assemblies having a fire-resistance rating of not less than two hours, each such section may, for the purposes of this subsection, be deemed to be a separate building.

(3) No exit-way shall decrease in width in the direction of travel towards the exit, except as set out in subsection (1) of section 26.

(4) Every change in level of the floor of an exit-way shall be effected by means of a ramp or a stairway.

(5) For the purposes of subsection (1), exit-way components shall comprise—

(a) passageways and ramps;
(b) stairways;
(c) foyers, vestibules and lobbies;
(d) doorways;
(e) exit-courts.

DISPOSITION AND MINIMUM NUMBER OF EXIT-WAYS

24. (1) Subject to any other provisions in this Chapter requiring a greater number of exit-ways, every building shall have at least one exit-way, and every room in any building or in a division of a building shall have access by means of at least one doorway (hereinafter referred to as an access doorway) to at least one exit-way.

(2) Except as hereinafter provided in this Chapter, every room or group of rooms, forming a dwelling-unit in a building shall be served by not less than two separate exit-ways, so arranged that should any one such exit-way become unusable or inaccessible, at least one other such exit-way may reasonably be expected to remain usable and accessible:

Provided that there need be only one exit-way to serve dwelling-units with a floor area not exceeding 250 square metres on any storey if the floor level of the top storey of the building is not greater than 6 metres above ground-level.

(3) For the purpose of subsection (2) the floor area means the plan area including verandas and balconies, but excludes the thickness of containing walls, lift shafts, light wells, ramps, stairways and the like.

(4) A room or group of rooms forming a dwelling-unit shall be considered to be served by two separate exit-ways if—

(a) it is possible to proceed from a doorway in such room or group of rooms or from a

point in an exit passageway to two alternative routes of escape from the storey on which the room or group of rooms is situated, and thence to the street; and

(b) the two alternative routes of escape are situated in opposite directions, in relation to the doorway or point in the exit passageway.

(5) If only one exit doorway is provided from any dwelling-house or dwelling-unit there shall be an alternative means of egress from the dwelling-house or dwelling-unit acceptable to the local authority.

(6) Except within a dwelling-house or dwelling-unit, the length of a passageway which is not served by two separate exit-ways (in this subsection referred to as a dead-end passageway) measured from a point which is served by two separate exit-ways to the access doorway most distant from such point, shall not exceed—

(a) for an interior or enclosed passage, 7,5 metres; and

(b) for a passage open to the air on at least one side, 15,0 metres:

Provided that—

(i) not more than twenty-five persons shall be served by any one such dead-end passageway; and

(ii) no dead-end passageway shall discharge into an enclosed stairway without first reaching a point in a passageway which is served by two separate exit-ways.

(7) The clear distance between any two stairways which are components of required exit-ways shall be not less than 7,5 metres, unless—

(a) such stairways are separated by a wall having a fire-resistance rating of not less than two hours; and

(b) there is an access doorway through such wall protected as required for a doorway in an occupancy-separation structure.

(8) The top storey of any—

(a) business, commercial or industrial occupancy-unit; or

(b) residential or storage occupancy-unit, other than one having a high fire-load;

not exceeding two storeys in height need have only one stairway forming a component of an exit-way leading from such storey to the ground storey:

Provided that—

(i) the floor area of such top storey does not exceed 300 square metres; and

(ii) the top storey is a residential occupancy-unit above a business, commercial or industrial occupancy-unit or above a storage occupancy-unit, and such stairway is independent of any exit-way from the ground storey; and

(iii) such stairway is constructed of non-combustible materials.

(9) Basements having a low fire-load and used only for storage purposes need have only one stairway forming a component of an exit-way, if the floor area of such basement does not exceed 100 square metres.

(10) Every building of two or more storeys in height in which the floor area of any storey above the ground storey exceeds—

(a) 1 000 square metres in an occupancy-unit having a low fire-load;

(b) 600 square metres in an occupancy-unit having a moderate fire-load; and

(c) 400 square metres in an occupancy-unit having a high fire-load;

shall have not less than three exit-ways serving every such storey, including the ground storey.

(11) The exit-way from an occupancy-unit used for—

(a) a high fire-load occupancy; or

(b) a public and assembly occupancy, where the population of the occupancy-unit concerned exceeds 300;

shall be entirely separate from, and independent of, the exit-ways serving any occupancy-unit in the same building which is used for any other purpose:

Provided that an exit-way from an occupancy-unit referred to in paragraph (a) or (b) may discharge into an enclosed stairway forming a component of an exit-way serving other occupancy-units which do not have a high fire-load.

(12) No exit-way or portion thereof which serves an occupancy-unit in one tenancy shall pass through an occupancy-unit which is, or may reasonably be expected to be, in a different tenancy.

(13) Except as provided in section 34, no access doorway shall serve a greater population of the room it serves than the following—

(a) for a low fire-load occupancy, 40;

(b) for a moderate or high fire-load occupancy, 20.

(14) No point on the floor of any room shall be farther from an access doorway, measured along the shortest route of travel, than the following—

(a) for a low fire-load occupancy, 30 metres;

(b) for a moderate fire-load occupancy, 20 metres;

(c) for a high fire-load occupancy, 10 metres:

Provided that, in the case of a dwelling-unit having a single access doorway to an exit-way, no point in the dwelling-unit shall be farther from the access doorway, measured along the shortest route of travel, than 30 metres.

(15) Every space on a roof of a building in which persons are allowed to work or congregate shall be served by exit-ways as though it were a room of a building.

(16) Notwithstanding the requirements of subsection (2), but subject to the requirements of subsections (13) and (14), it shall be permissible to erect partition-walls within a space contained in an occupancy-unit in one tenancy to form separate rooms, so that access to an exit-way from one or more such rooms is obtained by passing through one or more other such rooms:

Provided that—

(i) every door in every such room through which access to an exit-way is gained from any other such room shall not be capable of being locked; and

(ii) the partition-walls shall be not higher than 2,1 metres, and the space above them shall be open; and

(iii) every passage formed between such rooms within such a space shall comply with the requirements for a dead-end passage, as set out in subsection (6), except for such portions of such first-mentioned passage as are served by at least two access doorways to an exit-way without the necessity for passing through any such room.

(17) Any exit-way which serves a basement shall be entirely separated from any other exit-way, if the population of the building in which such basement is situated exceeds 40 persons:

Provided that such exit-way may discharge into an exit-court which is a component of another exit-way.

(18) Where the population of a building in which a basement is situated does not exceed 40 persons, and an exit-way which serves the basement is not separated from any other exit-way, such first-mentioned exit-way shall be marked at ground-floor level with a "NO EXIT" sign in block letters of not less than 150 millimetres in height.

POPULATION SERVED BY AN EXIT-WAY OR EXIT-WAYS

25. (1) The maximum population of any building or any portion thereof, for which an exit-way is required to serve shall be the maximum number of persons actually occupying such building or portion thereof at any time:

Provided that such maximum population shall, in any event, be deemed to be not less than the sum of the population figures obtained by dividing the gross floor area of each occupancy-unit or portion thereof, in such building or portion thereof, by the appropriate figure in Table XIII.

(2) Where an occupancy-unit is used at different times for different occupancies, the population of such unit shall be calculated for that occupancy which gives the greatest population.

(3) The population served by a stairway or stairways forming a component or components of an exit-way, and serving not more than five storeys of a building above finished ground-level, shall be deemed to be the population of any two adjoining storeys having the greatest aggregate population.

(4) The population served by such stairway or stairways serving not less than six and not more than eight storeys of a building above finished ground-level shall be 25 *per centum* greater than the population calculated in accordance with the provisions of subsection (3).

TABLE XIII

POPULATION DEEMED TO BE SERVED BY AN EXIT-WAY

1	2
Nature of occupancy-unit	Area per person, in square metres
(a) Auditoria in theatres, cinemas and other similar public and assembly occupancy-units, in which the major portion of the floor space has fixed seating	0,6
(b) Restaurants and cafés	1,2
(c) Dance-halls and other similar public and assembly occupancy-units, not being those listed under (a)	1,4
(d) Class-rooms in schools and colleges whether residential or non-residential	1,6
(e) Public and assembly occupancy-units, other than those listed under (a), (b), (c) and (d)	3,7
(f) Shops on ground storeys and in basements	2,8
(g) Shops on storeys above the ground storey	5,6
(h) Business, commercial or industrial occupancy-units other than those listed under (f) and (g)	9,3
(i) Dormitory blocks and educational hostels in residential schools and colleges	7,0
(j) Institutional and residential occupancy-units other than those listed under (i)	11,6
(k) Storage occupancy-units, including parking-garages and motor-vehicle show-rooms	28,0

(5) The population served by such stairway or stairways serving more than eight storeys above finished ground-level shall be 50 *per centum* greater than the population calculated in accordance with the provisions of subsection (3).

REQUIRED WIDTH OF EXIT-WAYS

26. (1) The width of an exit-way or the aggregate width of exit-ways serving any building or portion of a building shall be not less than a width calculated in accordance with the following formula—

$$W \text{ (width)} = N \times 275 \text{ millimetres (width-unit)}$$

where N = the width-number (number of width-units) found from the equation

$$N = \frac{P}{E}$$

where P = the population served by the exit-way or exit-ways concerned at the point or points at which the widths are being considered

E = the maximum number of persons per width-unit of exit-way set out in Table XIV

N shall be calculated to the nearest whole number, fractions less than one-half being disregarded:

Provided that, in any event, the width of any exit-way shall be not less than 1,1 metres, except that—

(a) in any building having a population not exceeding 25; and

(b) in any building not exceeding two storeys in height having a low fire-load and a population not exceeding 40;

the minimum width shall be 900 millimetres for a stairway and 800 millimetres for other components of the exit-way.

TABLE XIV

NUMBER OF PERSONS PER WIDTH-UNIT OF EXIT-WAY

1	2	3
Occupancy of building	Number of persons per width-unit in—	
	Ground storey	Basements and storeys above ground storey
(a) Places of assembly (indoors) .	50	30
(b) Places of assembly (outdoors)	150	90
(c) Public and assembly occupancy other than places of assembly	30	20
(d) Institutional and residential .	25	15
(e) Occupancy-units in business, commercial or industrial occupancies and storage occupancies, all having a high fire-load, and windowless buildings	25	15
(f) Occupancy-units in business, commercial or industrial occupancies and storage occupancies, all having a moderate or low fire-load	50	30

(2) The width of an exit-way shall be measured as the clear unobstructed width.

PASSAGEWAYS AND RAMPS

27. (1) The walls, floor and ceiling of every passageway or ramp forming a component of an exit-way in any occupancy-unit graded in section 4, as falling within grade A or grade B construction, shall be constructed of non-combustible materials.

(2) The headroom at every point in such passageways and ramps shall be not less than 2,3 metres, and the width shall be not less than the width prescribed for exit-ways in section 26.

(3) No door or window shall open so as to obstruct any such passageway or ramp.

(4) There shall be no step or ramp within a distance of 750 millimetres on either side of any doorway in any such passage-way.

(5) No such ramp shall have a slope exceeding 1 in 12.

(6) The floor of every such passageway and ramp shall have a non-slip surface free from any projections which might cause stumbling.

(7) Every such passageway and ramp which is not bounded by walls shall be provided with parapets, railings or other means of protection against falling, and such means of protection shall be not less than 1,05 metres in height.

(8) It shall be permitted to connect two buildings or separate divisions or portions of a building by means of a bridge, gallery, balcony or passage, constructed of non-combustible materials and of a width of not less than the width prescribed for exit-ways in section 26.

STAIRWAYS

28. (1) In this section—

"curved stairway" means a stairway, circular in plan, surrounding an open well;

"spiral stairway" means a stairway, circular in plan, which has the treads radiating from, and attached to, a central column.

(2) Every stairway forming an exit-way or a component of an exit-way, except stairways extending from the ground storey to the first storey of dwelling-houses not exceeding two storeys in height, shall be supported by non-combustible construction and be constructed of non-combustible materials:

Provided that combustible material may be used for the finish to risers and treads to such stairways, other than stairways in basements, if such finish is fixed direct to bases of non-combustible material.

(3) The headroom at every point of any stairway forming an exit-way or part thereof, shall be not less than 2,3 metres, and the width of such stairway shall be not less than the width of exit-ways prescribed by section 26.

(4) No door or window shall open so as to obstruct any stairway forming an exit-way or part thereof.

(5) All treads and risers of interior stairs shall be so dimensioned that the product of the width of tread, exclusive of nosing, and the height of riser, in millimetres, shall be not less than 42 000 and not more than 55 000.

(6) The rise of any step in any interior stairway shall be not more than 200 millimetres, and the width of any tread, measured horizontally between risers, shall be not less than 230 millimetres.

(7) The rise of steps and the width of treads shall not vary by more than 5 millimetres in any one flight of stairs.

(8) Nosings to treads shall project not more than 40 millimetres beyond the face of the riser.

(9) Subject to the provisions of this section, every interior stairway shall be in straight or uniformly curved flights between landings:

Provided that the minimum internal radius of a curved stairway, measured from the centre-point of such circle or oral to the nearest point of the tread, shall be not less than 1,8 metres.

(10) No flights of stairs shall have a vertical rise greater than—

(a) 2,135 metres for public and assembly occupancy; or

(b) 3,5 metres for all other occupancies;

without intervening landings.

(11) The length and width of a landing shall be not less than the width of the stairway:

Provided that landings on straight flights need not exceed—

(a) where the stairway is in a building for public and assembly occupancy, 1 metre; or

(b) where the stairway is in a building designed for single domestic occupancy, 750 millimetres.

(12) Nothing in this section shall prohibit the use of a spiral stairway in any dwelling but such a stairway may only be provided in a building used for a business, commercial or industrial occupancy if—

(a) it is additional to the stairway required by sections 23 and 24; and

(b) it is not less than 650 millimetres clear in width, no riser exceeds 200 millimetres and the number of treads in a full circle does not exceed 12, or such further number as may be approved by the local authority.

(13) A spiral stairway may be used to give access to a mezzanine floor, where no other means of escape is available:

Provided that—

(i) the height of such mezzanine floor does not exceed 2,8 metres above the general floor-level; and

(ii) the area of such mezzanine floor does not exceed 100 square metres.

(14) Every interior stairway, except a stairway which is open to the air at every storey-level, in any occupancy-unit falling into any one of classes 1 to 8 in section 4, shall be protected by enclosing-walls constructed of non-combustible materials and having a fire-resistance rating of not less than one hour, with doorways fitted with fire-doors having a fire-resistance rating of not less than one hour.

(15) Such doors shall be self-closing, and shall not be fastened in the open position, and such enclosing-walls shall be continuous from the floor of the ground storey to the underside of the roof construction.

(16) Notwithstanding anything to the contrary contained in subsection (14), the following stairways need not be enclosed as therein provided—

(a) any stairway serving a mezzanine storey which has a floor area not exceeding 25 *per centum* of the floor area of the storey immediately below such mezzanine storey; or

(b) any stairway serving a balcony which has a floor area not exceeding 25 *per centum* of the floor area of the room served by such balcony; or

(c) any stairway from the ground storey to the first storey, when such stairway is not part of an exit-way.

(17) Every interior stairway shall be provided throughout its length with hand-rails, banisters or railings, in accordance with the following requirements—

(a) every stairway not exceeding 1,1 metres in width shall have at least one hand-rail;

(b) every stairway exceeding 1,1 metres in width shall have hand-rails on both sides of such stairway;

(c) every stairway exceeding 1,65 metres in width in schools and colleges, and all other stairways exceeding 2,2 metres in width, shall have, in addition, intermediate hand-rails dividing such stairways into equal parts not exceeding 1,65 metres wide;

(d) such intermediate hand-rails shall be continuous, be securely supported and fixed without sharp corners;

(e) where any side of such stairway is not bounded by a wall, such side shall be provided with a hand-rail and banisters, or approved railings;

(f) all hand-rails shall be fixed at a height of not less than 850 millimetres measured perpendicularly off the intersection of the riser and front of tread, and the height of hand-rails on the landing portion shall be not less than 990 millimetres measured perpendicularly off the landing.

(18) Every exterior stairway forming an exit-way or a component of an exit-way shall be of non-combustible material and be provided with hand-rails, as required by subsection (17).

(19) Each side of such stairway which is not protected by a wall shall be provided with a parapet, balustrade, banister or other approved means of protection against falling, having a height of not less than 850 millimetres measured perpendicularly off the intersection of the riser and front tread, or 990 millimetres from the floor of a landing, and such protection shall be constructed of non-combustible materials.

(20) Every such exterior stairway which is not required, in terms of section 26, to exceed 900 millimetres in width, may be constructed of unprotected steel without risers and with treads of not less than 200 millimetres in width:

Provided that—

(i) the angle each flight of stairs in such stairway makes with the horizontal shall not exceed 45 degrees; and

(ii) the total vertical height of such stairway shall not exceed 18 metres.

LOBBIES, FOYERS AND VESTIBULES FORMING PART OF AN EXIT-WAY

29. (1) The walls, floor and ceiling of every lobby, foyer and vestibule forming a component of an exit-way in any occupancy-unit which falls into grade A or grade B construction, as set out in section 4, shall be constructed of non-combustible materials.

(2) The headroom at every point in such lobby, foyer or vestibule shall be not less than 2,3 metres, and the unobstructed width shall be not less than one-third greater than the sum of the widths of the exit-way components immediately discharging into it.

(3) The sum of the widths of the exit-way components providing egress from any such lobby, foyer or vestibule shall be not less than the width of such lobby, foyer or vestibule.

(4) The floor of such lobby, foyer or vestibule may be in the form of a ramp, complying with the requirements of section 27.

(5) Such lobbies, foyers and vestibules shall not be used for trading or other activities, except such as are provided and conducted primarily for the convenience of the occupants of the occupancy-unit served thereby.

(6) Any structure or furniture used for any such activity shall be so located as not to reduce the required width of the lobby, foyer or vestibule, or form an obstruction within such required width.

(7) The total floor area occupied or covered by such structures or furniture shall not exceed 10 square metres or 20 *per centum* of the total floor area of the lobby, foyer or vestibule, whichever is the lesser.

DOORWAYS AND DOORS FORMING PART OF AN EXIT-WAY

30. (1) No doorway forming a component of an exit-way shall be less than 2 metres in height, and the clear width of such doorway shall be not less than the width required by section 26.

(2) Every door fitted to any such doorway, and every door providing means of egress from a place of assembly into an exit-way, shall be a door so hung as to swing in the direction of travel to the exit.

(3) No single door shall be more than 1,1 metres in width.

(4) No door referred to in subsection (2) shall be hung so as to obstruct, when open, the exit-way.

(5) The fastenings on any door providing a means of egress from a place of assembly shall be panic-bolts, or other approved fastenings, rapidly openable from the inside without the use of keys or any special knowledge, and by the application of a force of not more than 90 newtons.

(6) Revolving doors shall not be permitted in places of assembly or as components of an exit-way in other occupancies.

EXIT-COURTS

31. (1) Every exit-court shall have a hard, regular floor with a non-slip surface free from any projections which may cause stumbling, and any change in level in such floor shall be effected by means of a ramp or stair complying with the provisions of this Chapter.

(2) Every exit-court shall be at least 1,1 metres in width or not less than the width required by section 26, whichever is the greater, and its walls shall be free from columns, pipes or projections other than hand-rails:

Provided that the pipes of plumbing systems and similar projections may be—

(a) located in recesses formed in the walls of exit-courts and enclosed by smooth boarding or sheeting to a height of not less than 1,65 metres, so as to leave no projecting corners; or

(b) placed against the walls of such exit-courts and enclosed as described above, so as to leave a clear width of not less than that required.

(3) No door or window shall open into an exit-court so as to obstruct its width below a height of 2,1 metres above its floor.

(4) Every exit-court which is not bounded by walls shall, if the local authority so requires, be provided with parapets, balustrades, banisters or other approved protection against falling, constructed of non-combustible materials, and having a height of not less than 1,05 metres from the floor of such exit-court.

EXIT-SIGNS AND LIGHTING OF EXIT-WAYS

32. (1) Where a local authority deems it necessary, in any place of assembly, every point of access to an exit-way shall be clearly and prominently marked by an exit-sign.

(2) Except where written exemption has been obtained from the local authority the following illuminated signs in accordance with B.S. 2560 shall be exhibited in all places of assembly—

(a) at or over each doorway normally used for public exit, an "EXIT" sign;

(b) at or over each doorway not normally used for public exit which is available as a means of exit in cases of alarm, an "EMERGENCY EXIT" sign in accordance with B.S. 2560 except that the over-all dimensions of the lettered panel referred to in clause 2 of that standard shall be 400 millimetres by 300 millimetres and the word "EMERGENCY" may be in letters 75 millimetres in height and situated above the word "EXIT";

(c) at or over each doorway which does not lead to an exit a "NO EXIT" sign in accordance with B.S. 2560 except that the over-all dimensions of the length of panel referred to in clause 2 of that standard shall be 700 millimetres by 200 millimetres and the words "NO EXIT" shall be on one line.

(3) The colour filters for all illuminated signs exhibited in terms of subsection (2) and referred to in clause 5 of B.S. 2560 shall be—

(a) primary red No. 6 in the case of "EXIT" and "EMERGENCY EXIT" signs; and

(b) peacock blue No. 15 in the case of "NO EXIT" signs.

(4) All illuminated signs exhibited in terms of subsection (2) shall be illuminated from within the housing by two systems of electrical supply, one of which shall be the general lighting system and the second shall be the safety lighting system as defined in C.A.S. No. CC1 and have a level of luminance as referred to in clause 9 of B.S. 2560 of between 15 and 35 candelas per square metre.

(5) All illuminated signs in terms of subsection (2) shall be in view of the public and shall be not less than 2 metres nor more than 2,5 metres from the floor unless otherwise approved by the local authority.

(6) Notwithstanding the provisions of subsection (2) of this section the local authority may permit signs in accordance with B.S. 4218 or any other types of signs where appropriate, providing that the signs in the opinion of the local authority are legible and the level of luminance is acceptable.

(7) Directions to be followed in the case of fire printed "EMERGENCY EXIT" in red block-type letters of a minimum height of 75 millimetres, on a white background, shall be affixed in each building as the local authority may require and in such conspicuous places therein as the local authority may direct.

PROTECTION OF EXIT-WAYS AGAINST FIRE

33. (1) Subject to the requirements of sections 7, 8, 11, 12 and 23, every wall, floor, ceiling and stairway forming a component of an interior exit-way in any occupancy-unit falling within the categories set forth in Table XV shall have a fire-resistance rating of not less than one hour, unless otherwise approved by the local authority:

Provided that doors in access doorways to such exit-ways shall have a fire-resistance rating of not less than half an hour.

TABLE XV

OCCUPANCY-UNITS IN WHICH INTERIOR EXIT-WAYS MUST HAVE FIRE PROTECTION

1	2
Occupancy-unit and fire-load	Height, in storeys
(a) Business, commercial and industrial, high fire-load	2 or more
(b) Business, commercial and industrial, moderate fire-load	4 or more
(c) Business, commercial and industrial, low fire-load	6 or more
(d) Institutional of class 1	1 or more
(e) Public and assembly (indoor)	1 or more
(f) Institutional and public and assembly (other than as in (d) and (e))	2 or more
(g) Residential, other than dwelling-houses	4 or more
(h) Storage, high fire-load	2 or more
(i) Storage, moderate fire-load	3 or more
(j) Storage, low fire-load	4 or more

(2) Every wall-lining, to the walls of an exit-way referred to in subsection (1), shall be of non-combustible material.

(3) Every doorway forming a component of an exit-way referred to in subsection (1), and windows opening on to such exit-way, shall comply with the following requirements—

(a) every such doorway, other than a doorway forming an exit, shall be protected by an approved self-closing or automatic fire-door having a fire-resistance rating of at least one hour;

(b) every window-opening formed in an internal wall abutting a component of such exit-way shall be protected by a non-openable or self-closing fire-window having a fire-resistance rating of not less than one hour, situated with the sill at a height of at least 1,8 metres above floor-level;

(c) in an internal wall abutting such an exit-way, other than an interior dead-end passageway which is not served by two separate exit-ways, there shall be not more than one openable window or fan-light in any 2,7-metre length of wall, and the ventilation area of such window or fan-light shall not exceed 1 400 square centimetres;

(d) in an internal wall abutting an interior dead-end passageway which is not served by two separate exit-ways, there shall be no ventilation-openings, other than door-openings, apart from air-bricks or louvres, situated within a height of 600 millimetres from the floor-level, and the ventilation area of such openings shall not exceed 200 square centimetres per room or 200 square centimetres per 4,5-metre length of passageway, whichever is the greater;

(e) every doorway formed in any external wall which abuts any component of such exit-way, and which is within a distance of 4,5 metres, in any direction, from a stairway forming a component of such exit-way, shall be protected by an approved self-closing or automatic fire-door having a fire-resistance rating of at least half an hour;

(f) every window-opening, except an opening having a window not exceeding 0,5 square metre in area serving a water-closet or bath-room, formed in any external wall which abuts any component of an exterior exit-way, and which is within a distance of 4,5 metres, in any direction, from a stairway forming a component of such exit-way, shall be protected by—

(i) an approved self-closing fire-window; or

(ii) a window provided with an approved self-closing or automatic metal shutter;

in each case having a fire-resistance rating of not less than half an hour;

(g) every window-opening formed in any external wall abutting a dead-end exterior passageway which is not served by two separate exit-ways shall have its sill not less than 1,8 metres above the floor-level of such passageway.

(4) One stairwell or, where required by the local authority, more than one stairwell in each building shall be provided with—

(a) an entrance-lobby on each floor, with entrance and exit doorways complying with paragraph (a) of subsection (3), such lobby measuring not less than 2 metres by 1,5 metres, with a ceiling at least 300 millimetres higher than the top of the doorway openings; and

(b) a mechanical supply system, introducing outside air to the stairwell and lobbies at a

rate which will maintain a pressure, with all doors closed, of 2,50 millimetres water gauge minimum above ambient.

(5) Supply systems mentioned in subsection (4) shall be—

(a) arranged to come into operation automatically when fire is detected, by means approved by the local authority;

(b) powered both from mains-supply and from an emergency alternator driven by compression-ignition engine to come into operation automatically in case of failure of mains-supply.

(6) Wherever the floor of any room in a building of a business, commercial or industrial occupancy is subdivided or obstructed by partitions, counters, benches, seats, tables, shelving, cupboards, goods and other obstructions which are of such a nature or weight as to be not readily removable in case of fire, such obstructions shall be so arranged as to leave aisles or openings between them, to enable the occupants of such room to reach a point of access to an exit-way.

(7) The aisles or openings referred to in subsection (6) shall be not less than 750 millimetres in width, but, where the public have access to them, such aisles shall be of such greater width, as would be required in terms of section 26.

PART IV

SPECIAL REQUIREMENTS FOR CERTAIN BUILDINGS AND PORTIONS THEREOF

PLACES OF INDOOR ASSEMBLY

34. (1) Every place of assembly of an indoor nature shall comply with the requirements of this section.

(2) *Submission of plans.*—In respect of every building to be used as a place of assembly, plans in duplicate shall be submitted to the local authority for approval, showing—

(a) the arrangements of movable and permanently fixed seating for the accommodation of an audience; and

(b) the position and area where it is proposed that standing audience be accommodated; and

(c) the number of standing persons which it is proposed to accommodate; and

(d) the position or positions where it is proposed that wheel chairs shall be accommodated.

(3) Such plans shall be on approved material to a scale of 1:50, provided that in special circumstances the local authority may permit plans to a smaller scale, and a copy of the approved plan shall be exhibited in the building where it can be seen by the public.

(4) *Seating.*—All seats in any theatre or cinema shall be tip-up seats unless written exemption is obtained from the local authority. The seats shall be provided with both arms and backs, and shall be fixed in an approved manner to the floor in rows, excepting those in a theatre box.

(5) In places of assembly involving closely seated audiences other than a theatre or cinema, where the seats are not fixed to the floor, they shall be rigidly fastened together when in use in an approved manner in groups of not less than 20 seats, with not less than three rows of seats one behind the other and not less than three seats side by side:

Provided that in such places as are used primarily for serving food or drinks on tables and containing not more than 150 seats, individual unfixed seats may be used.

(6) All seating for an audience arranged in rows shall comply with the following requirements—

(a) the width of the seats shall be—

(i) not less than 510 millimetres centre to centre where arms are provided to the seats;

(ii) not less than 460 millimetres centre to centre where no arms are provided to the seats;

(b) a clear walkway of not less than 305 millimetres shall be retained between perpendiculars between the back edge of one seat and the front edge of the nearest part of the seat immediately behind when the seats are in the down position;

(c) the spacing of rows of seats measured between perpendiculars between the back edge of one seat and the back edge of the seat immediately behind shall be as follows—

(i) where restaurant service is provided in a place of assembly during a performance at times other than during an interval, not less than 1,065 metres;

(ii) in other cases, not less than 815 millimetres where backs are provided to seats and not less than 710 millimetres where no backs are provided to seats;

(d) there shall be not more than seven seats intervening between any seat and a longitudinal aisle running at right angles to the rows of seats:

Provided that—

(i) where a clear walkway between rows measured in the manner set out in paragraph (b) is not less than 555 millimetres; and

(ii) where there is a longitudinal aisle of not less than 1,37 metres in width at both ends of such rows;

not more than thirty-five seats may be fixed in any row;

(e) provision shall be made within the seating area for not less than two wheel-chairs unless written exemption is obtained from the local authority.

(7) *Aisles.*—The width of every longitudinal aisle shall be not less than 915 millimetres plus 40 millimetres for every 1,5 metres or remaining portion thereof of its length and such aisle shall maintain a

constant width throughout its length from the beginning of such aisle to its intersection with a cross-aisle or to a point of access to an exit-way.

(8) Cross-aisles, that is aisles running parallel to the rows of seats, shall be provided so that no longitudinal aisle serves more than 25 rows of seats, in the case of cross-aisles on the ground storey, or more than 15 rows of seats, in the case of any other storey.

(9) Every cross-aisle shall discharge at both ends directly to a point of access to an exit-way.

(10) The width of every cross-aisle shall be not less than the greater of the following widths—

(a) the maximum width of any longitudinal aisle which intersects such cross-aisle; or

(b) such width as would be required in terms of section 26, if such cross-aisle were a component of a required exit-way.

(11) Every cross-aisle shall be provided with railings of not less than 760 millimetres in height, fixed between adjacent rows of seats, except where the backs of seats adjoin the aisle and project at least 760 millimetres above the floor of the aisle.

(12) No aisle shall have a slope greater than 1 in 12, and all aisles shall have sufficient friction under all conditions to allow the public to negotiate the surface in complete safety.

(13) Any steps in an aisle shall extend across the full width of the aisle and shall be uniform in height of rise and width of tread with the nosing of every tread—

(a) illuminated at all times when the public is in occupation of the building; and

(b) conspicuously marked.

(14) No steps up or down from aisles to seating platforms shall be permitted.

(15) Aisles shall be widened to the full unobstructed width of exit doors to a distance of at least 2 metres from such doors.

(16) No part of the main area assigned for the seating or standing of any person shall be measured as part of any aisle.

(17) *Exit-ways.*—Exit-ways shall comply with the following requirements—

(a) every gallery, balcony or other similar portion of an auditorium, and the main floor of such auditorium, shall each be provided with its own separate and distinct exit-ways:

Provided that no more than 50 per centum of the capacity of each such separate and distinct exit-way may discharge into a common main lobby, foyer or vestibule, where such lobby, foyer or vestibule itself discharges directly to a street or public place;

(b) no curtains or other hangings shall be hung across, or in front of, any doorway forming a component of an exit-way or a point of access to such exit-way;

(c) every salient angle formed by the walls of an exit-way shall be rounded off to a radius of not less than 250 millimetres, and, except in the case of lobbies, foyers and vestibules, every re-entrant angle formed by the walls of such exit-way shall be covered to a radius of not less than 600 millimetres;

(d) every stairway forming a component of an exit-way or steps in any aisle, shall have risers not exceeding 180 millimetres or less than 75 millimetres in height and treads of not less than 230 millimetres in width of which nosings shall not exceed 25 millimetres;

(e) notwithstanding anything to the contrary contained in section 31—

(i) where an exit-court serves any public and assembly occupancy-unit of an indoor nature having a population not exceeding 600 persons, such exit-court shall be not less than 1,8 metres in unobstructed width; and

(ii) the minimum width prescribed in subparagraph (i) shall be increased by 150 millimetres for every additional 100 persons or remaining part thereof of population over 600;

(f) provision shall be made for ramped or other approved access to the area referred to in paragraph (e) of subsection (6) for wheelchairs unless written exemption is obtained from the local authority.

(18) *Access doorways to exit-ways.*—Every auditorium, including every gallery and balcony or other portion of an auditorium, shall be provided with a number of access doorways opening direct into required exit-ways, according to the population to be accommodated in such auditorium.

(19) Such doorways shall be not less than 1,12 metres wide and of such aggregate width, as is required in terms of section 26, and shall comply with the requirements of section 30.

(20) Such doorways shall be opposite aisles, and any additional doorways shall be so arranged as to achieve an even flow of the population into the exit-ways, and at least one such doorway shall be placed near the stage.

(21) The number of access doorways shall be not less than the appropriate number calculated from Table XVI:

Provided that a box or gallery capable of accommodating a maximum of 35 people may have only one exit.

TABLE XVI

ACCESS DOORWAYS IN AUDITORIA

1	2
Population	Minimum number of doorways
Up to 200	2
201– 300	3
301– 400	4
Over 400	4 plus 1 additional for every additional 500 or part thereof

(22) Notwithstanding the provisions of subsection (21), any auditorium referred to in subsection (13) of section 36 shall have not less than one access doorway leading to an exit-way for very 150 persons

or remaining portion thereof of the population of such auditorium.

(23) *Railings.*—Railings, constructed to withstand a horizontal load of 3 kilonewtons per metre assumed to act at the top of the rails, shall be provided in the following cases—

(a) the front of every balcony, gallery or box shall be provided with substantial metal railings, or other approved protection against falling, of not less than 760 millimetres in height, measured from the floor-level of such balcony, gallery or box;

(b) in every balcony, gallery or other similar structure, where seats in rows are arranged in successive tiers and the height of the rise from one tier to another exceeds 280 millimetres, a substantial metal railing or other approved protection of not less than 760 millimetres in height, measured from the floor of such tier, shall be fixed as near as practicable to the edge of such tier along the entire row of seats.

(24) *Lighting.*—Lighting shall comply with the following requirements—

(a) every auditorium, including exit-ways and exit signs pertaining thereto, shall be lighted by natural or electric light to an intensity of not less than 10,76 lux;

(b) every place of assembly used during the hours of darkness shall be provided with lighting, including an emergency lighting system, in accordance with C.A.S. No. CC1;

(c) the control of such system shall be accessible only to a responsible member of the auditorium staff or fire department of the local authority;

(d) where the local authority considers it necessary, an additional and separate room shall be erected for the accommodation of any emergency source of electric power;

(e) in every theatre, cinema or concert-hall, portable emergency lights, such as electric flash-lights, shall be kept available in sufficient number in case of complete failure of all electrical installations.

(25) Notwithstanding the provisions of subsection (24)—

(a) the local authority may exempt any place of assembly intended for use by less than 250 people from the provision of an emergency lighting system on receipt of a written application, and under such conditions as it deems fit;

(b) every place of assembly used or intended for use exclusively for public worship shall be exempt from the provision of an emergency lighting system.

(26) *Communication with fire department.*—Every place of assembly used or intended for use by more than 500 persons shall be fitted with a device giving direct communication with the fire department of the local authority.

PLACES OF OUTDOOR ASSEMBLY:

PROVISION OF SEATING IN GRANDSTANDS AND SIMILAR STRUCTURES

35. (1) Every place of assembly of an outdoor nature, such as grandstands and stadia, shall comply with the requirements of this section.

(2) *Seating.*—All seating shall be firmly fixed in rows and may be with or without back-rests.

(3) In the case of all seating accommodation, including grandstands—

(a) the width of seating accommodation provided or intended to be provided for each person shall be not less than 460 millimetres; and

(b) each tier of seating shall be not less than 685 millimetres in horizontal depth and not more than 380 millimetres in height; and

(c) if timber planks are used to construct the seating, such planks shall—

(i) be not less than 40 millimetres thick; and

(ii) not cantilever more than 150 millimetres beyond any support; and

(iii) not terminate on any support unless they have a bearing of at least 75 millimetres; and

(d) the supports for any planks referred to in paragraph (c) shall be not more than 1,5 metres apart; and

(e) the situation on the site of all seating accommodation shall require the approval of the local authority.

(4) In the case of grandstands—

(a) no grandstand, other than earth-tier grandstands, shall exceed a height of 3,6 metres unless structural calculations relating to the grandstand have been submitted to, and approved by, the local authority, or a certificate has been submitted to the local authority by a structural engineer in terms of paragraph (e) of subsection (1) of section 6 of Chapter 2; and

(b) no grandstand shall be erected on the roof, balcony or veranda of any building or structure unless the local authority con-considers that the building or structure is capable of supporting—

(i) the load of the grandstand; and

(ii) the number of persons which the grandstand is intended to accommodate; and

(c) every grandstand, including earth-tier grandstands, shall be provided with barriers approved by the local authority—

(i) if it exceeds 2 metres in height, at the back and ends of every unit; and

(ii) if it is of or more than eight tiers in height, dividing the same into units of not more than eight tiers in height; and

(iii) if it is of or more than eight tiers in height and is more than 15 metres in

length, dividing the same into units of not more than 15 metres in length; and

(d) the space under every grandstand shall be kept free from extraneous flammable materials.

(5) Each of the barriers referred to in paragraph (c) of subsection (4) shall be capable of withstanding a horizontal force of 3 kilonewtons per metre applied at the top of such barrier.

(6) The local authority may, upon written application by the owner, in special cases, and where it is deemed necessary or desirable owing to the circumstances, and having due regard to the public safety, waive or relax any of the requirements of paragraphs (a), (b), (c) and (d) of subsection (3) and paragraph (c) of subsection (4).

(7) *Longitudinal aisles.*—Longitudinal aisles, that is aisles running at right-angles to the rows of seating, shall be provided so that no person seated in a row shall be more than 9,2 metres or 20 seats from a longitudinal aisle.

(8) The width of every longitudinal aisle shall be not less than 915 millimetres plus 40 millimetres for every 1,5 metres or remaining portion thereof of its length and such aisle shall maintain a constant width throughout its length from the beginning of such aisle to its intersection with a cross-aisle or to a point of access to an exit-way.

(9) *Cross-aisles.*—The width of any cross-aisle provided shall be not less than the width of the widest longitudinal aisle which the cross-aisle intersects, or the width required, in terms of section 26, if such cross-aisle were a component of a required exit-way, whichever is the greater.

(10) *Exits.*—The number of exits from grandstands and stadia shall be not less than the number specified in Table XVII, and the width of each such exit shall be as required for exit-ways by section 26, but in no case less than 1,8 metres.

TABLE XVII

MINIMUM NUMBER OF EXITS FROM GRANDSTANDS AND STADIA

1	2
Population	Minimum number of exits
Up to 1 000	2
1 001–3 000	3
Over 3 000	3, plus 1 additional for every additional 2 000 of population or remaining part of 2 000

(11) Such exits shall be spaced not more than 23 metres apart for exits from grandstands constructed of combustible materials and not more than 60 metres apart for grandstands constructed of non-combustible materials.

STAGES AND BACK-STAGE AREAS

36. (1) Except as provided in subsections (13) and (14), the provisions of this section shall apply to stages and back-stage areas in all theatres and other occupancy-units in which plays, operas or other productions necessitating the use of scenery take place.

(2) In all such occupancy-units, the stage and back-stage area shall be completely separated from the auditorium by a proscenium-wall having a fire-resistance rating of not less than four hours.

(3) Subject to the provisions of subsection (4), only three openings may be permitted in such proscenium wall other than the proscenium opening, and they shall be below the top of the proscenium opening protected by self-closing fire doors having a fire resistance rating of not less than 2 hours. Each permitted opening shall not exceed 2 square metres in area.

(4) In addition, openings in a proscenium-wall above the proscenium-opening may be permitted with the written permission of the local authority.

(5) Every proscenium-opening shall be provided with a fire-curtain, which shall be—

(a) capable of withstanding a lateral pressure of 480 pascals; and

(b) constructed of a rigid steel framework; and

(c) covered on the stage side with steel sheet not thinner than 1,6 millimetres; and

(d) covered on the auditorium side with steel sheet not less than 1,6 millimetres in thickness or by asbestos-cloth reinforced with interwoven wire; and—

(i) the edges of such cloth sheets shall butt together; and

(ii) the joints shall be protected by cover sheets of steel secured to the framework by screws or other approved means; and

(e) constructed so as to slide freely in vertical steel guides fixed to the stage-side on both sides of the proscenium-wall; and

(f) so arranged as to overlap the proscenium-opening by at least 450 millimetres on each side and by at least 600 millimetres at the top, when it is closed; and

(g) so arranged that, in the event of fire on or near the stage, it will descend automatically and completely, and effectively close the proscenium-opening, so as to prevent the passage of flame or smoke through such opening; and

(h) so arranged that, whenever it descends, whether actuated manually or automatically, it descends completely in not more than 30 seconds, but requires at least five seconds to descend the last 2 metres, and moves smoothly and without jerks throughout; and

(i) capable of being closed manually at any time; and

(j) provided with the following notice to be displayed on the auditorium side of the curtain in red block letters not less than 75 millimetres in height—

"THIS SAFETY CURTAIN MUST BE RAISED IN THE PRESENCE OF THE AUDIENCE BEFORE EACH PERFORMANCE".

(6) Every stage shall comply with the following requirements—

(a) the rigging-loft, fly-galleries and pin-rails shall be of non-combustible materials throughout;

(b) the fly-galleries shall be of meshed or slatted construction having clear openings aggregating not less than half the area covered by such galleries;

(c) one or more ventilators, equipped with openable shutters or sashes, shall be provided over the stage;

(d) such ventilators shall be of non-combustible material, and their aggregate openable area shall be at least one-tenth of the floor area of the stage;

(e) the ventilators shall be so constructed that they will open automatically in the event of a fire on the stage;

(f) the ventilators shall be capable of being opened manually at any time;

(g) the roof and ceiling over such stage shall be of non-combustible materials throughout;

(h) the troughs and frames for foot-lights and other lights, and all other fixtures and fittings on the stage which it is practicable to make of non-combustible material, shall be made of such material;

(i) all other fixtures and fittings, and all scenery and other things on the stage which it is not practicable to make of non-combustible material, shall be treated with approved fire-retardant paint or solution;

(j) every stage shall be provided with—

(i) an approved automatic sprinkler system; and

(ii) an approved drencher system, operating both manually and automatically, installed behind the fire-curtain referred to in subsection (5), so as to permit the discharge of water along the whole of the curtain on the stage-side; and

(iii) at least two hand fire-extinguishers;

(k) on the prompt-side of the stage, in a readily accessible position, there shall be provided a telephone or an approved fire-alarm system in direct communication with the fire department of the local authority.

(7) The apparatus for the operation of the fire-curtain, the stage ventilators and the stage drencher system shall likewise be located on the prompt-side of the stage, in a readily accessible position from at least two positions, one not more than 3 metres from a stage-door.

(8) The words "NO SMOKING" shall be conspicuously painted on the stage-side of the proscenium-wall on both sides of the proscenium-opening, in block letters of not less than 150 millimetres in height.

(9) All dressing-rooms, work-rooms, scenery-stores, property-stores and other rooms appurtenant to the stage shall be located in the back-stage area, which shall be separated from all other parts of the occupancy-unit here under consideration by walls, floors and ceilings having a fire-resistance rating of not less than four hours.

(10) The following two categories of back-stage rooms, namely—

(a) dressing-rooms, lavatories and rooms appurtenant thereto; and

(b) scenery-stores and property-stores;

shall be separated from each other by walls, floors and ceilings having a fire-resistance rating of not less than one hour.

(11) Doorways in the rooms referred to in subsection (10), which open on to the stage, shall be fitted with doors having a fire-resistance rating of not less than half an hour.

(12) The person having control of any stage shall ensure that—

(a) the fire-curtain of such stage is tested at the beginning of every performance, and lowered at the end of every performance; and

(b) the telephone or fire-alarm system on such stage is tested at the beginning of every performance; and

(c) no naked lights of any description are used on such stage:

Provided that such lights, if required in connexion with any performance, may be used with the permission of the local authority.

(13) Any stage forming part of an auditorium seating not more than 500 people, used solely for the presentation of theatrical and similar performances, shall, if the relevant requirements of the preceding subsections of this section are not complied with, be constructed in compliance with the following minimum requirements—

(a) every such stage and back-stage area shall be separated from the auditorium by a proscenium-wall having a fire-resistance rating of not less than 2 hours;

(b) any openings in such proscenium-wall, other than the proscenium-opening, shall be protected by self-closing doors having a fire-resistance rating of not less than half an hour;

(c) there shall be no openings in the proscenium-wall above the proscenium-opening;

(d) every proscenium-opening shall be provided with an approved heavy-woollen or asbestos-cloth curtain;

(e) all dressing-rooms and other rooms appurtenant to such stage shall be located in the back-stage area, and shall be separated from the stage by walls of non-combustible construction;

(f) any doorways in such walls which open on to the stage shall be fitted with self-closing fire-doors having a fire-resistance rating of not less than half an hour;

(g) every such stage shall be provided with at least two hand fire-extinguishers;

(h) the access doorways from such auditorium to exit-ways shall comply with the requirements of subsection (22) of section 34.

(14) Notwithstanding the provisions of subsection (13) and subject to compliance with paragraph (g) thereof, a proscenium curtain may be omitted for theatres seating not more than 250 people with the written permission of the local authority.

(15) All stages, dressing-rooms and other back-stage rooms shall be provided with exit-ways, which shall be entirely separate and distinct from, and independent of, the exit-ways serving the auditorium.

(16) Every back-stage area shall have at least two doorways leading direct to an exit-way or to a street or public place.

(17) Such doors shall be self-closing fire-doors having a fire-resistance rating of not less than half an hour, opening outwards, and shall be located as far as practicable from one another.

PROJECTION AND REWINDING ENCLOSURES

37. (1) In this section—

"projection-room enclosure" means an enclosure in which a projection unit is operated or in which the rewinding of film is undertaken or in which both such activities are conducted;

"projection unit" means a projector with or without a slides-machine.

(2) No flammable film shall be used in a projection unit in a place of assembly unless written permission is obtained from the local authority.

(3) In any building or part of a building used for cinematographical or theatrical performances the operation of a projection unit and the rewinding of film shall only be undertaken from within a projection-room enclosure, except where the provisions of subsection (15) or (20) apply.

(4) The projection-room enclosure shall comply with the following requirements—

(a) it shall be not less than 4,5 metres in length and 3,5 metres in width and 2,4 metres in height for one projector with an additional 1,75 metres in length for each additional unit;

(b) not more than a total mass of 150 kilograms of film in their respective cases may be kept in the projection-room enclosure at any one time, and such film must be kept in their containers when not in use;

(c) the projection-room enclosure shall have two means of egress through doorways, one of which shall lead direct to the open air.

(5) Every opening in the wall separating the auditorium from the projection-room enclosure shall be completely covered with armoured plate glass of at least 6 millimetres in thickness glazed into an incombustible frame.

(6) The size of such openings shall be not more than—

(a) for each projector, effects-machine or slides-machine, an opening 400 × 400 millimetres;

(b) one observation-opening, 400 millimetres by 300 millimetres, corresponding to each projector opening, as in paragraph (a);

(c) one opening, of not more than 800 × 750 millimetres, for combined uses of operator and spotlight or the like, when the stage is used for live performances.

(7) The doors of the projection-room enclosure shall be self-closing fire-doors, each of not less than 750 millimetres in width and 2 metres in height, opening outwards, having a fire-resistance rating of not less than half an hour, and shall not communicate directly with the auditorium.

(8) The walls, floors and ceilings of the enclosure referred to in subsections (3) and (4) shall be of non-combustible materials, and shall have a fire-resistance rating of not less than one hour.

(9) All shelves, furniture and fixtures within the enclosure shall be constructed of non-combustible material or of hardwood.

(10) Carbon and Xenon, or similar type arc-lamp housings shall be ventilated by means of a ventilating-cowl fixed over each machine, and leading to the outside air or by any other approved means.

(11) The projection-room enclosure shall, in addition, be supplied with at least 6 cubic metres of air per minute from a mechanical ventilation system.

(12) All inlet and outlet ventilation-openings shall be protected by wire netting or screens of not more than 13-millimetre mesh.

(13) Provision shall be made for switching on the auditorium lights from inside the projection-room enclosure and from at least one other convenient point in the building.

(14) In the projection-room enclosure the electric lighting shall be supplied from a power-circuit separate from all other circuits, and shall also be connected, through a separate circuit, to the emergency supply referred to in paragraph (b) of subsection (24) of section 34.

(15) Where a projection unit is operated or the rewinding of film is undertaken for performances, including the illustrating of lectures, in cases where the aggregate number of days on which performances are to be given does not exceed 30 in any one year or the audience does not exceed 35 people at any one time, such usage shall comply with the following requirements—

(a) the apparatus used must be of the portable type requiring a single-phase supply of not more than 13 amp at a voltage of 220–250;

(b) not more than two projectors or one projector and one slides-machine may be used at any one time;

(c) the apparatus must be operated from an approved non-combustible pedestal or stand;

(d) the amount of film shall not exceed 50 kilograms mass in the auditorium at any time and such film shall be in containers when not in use:

Provided that the provisions of this subsection need not be complied with if a projection-room enclosure is installed.

(16) All film not in actual use shall be kept in containers constructed of galvanized steel or other approved material and shall be constructed in an approved manner.

(17) Each container as described in subsection (16) shall contain reels of film not in excess of 50 kilograms total mass and shall have a tight self-closing door or lid of similar material.

(18) "NO SMOKING" signs, in clearly legible block letters, of at least 100 millimetres in height, shall be placed in prominent positions in the projection-room enclosure.

(19) Every projection-room enclosure shall be provided with at least one approved hand fire-extinguisher, a face shield and pair of leather gloves, and an approved asbestos blanket measuring not less than 2 × 2 metres.

(20) The provisions of this section shall not apply to the use of a projection unit in a dwelling.

ROOMS FOR STORAGE OR KEEPING OF FILM

38. (1) Film in excess of 150 kilograms shall only be stored or kept in rooms and positions complying with the requirements of this section.

(2) Nothing other than film and film-cement shall be kept in a film-storage room referred to in subsection (1).

(3) The walls, floors and roofs or ceilings of such rooms shall have a fire-resistance rating of not less than four hours.

(4) The cubic capacity of a room shall not exceed 21 cubic metres.

(5) The mass of film-stores in any one room shall not exceed 1 000 kilograms.

(6) An approved automatic sprinkler system shall be provided, and there shall be a sufficient number of sprinkler-heads to release 50 litres per minute per cubic metre of room-space, and the sprinkler-heads shall be arranged to give uniform distribution within the partitioned sections referred to in subsection (9).

(7) There shall be a water-supply sufficient to keep the system operating for not less than 20 minutes.

(8) Hand fire-extinguishers shall also be provided.

(9) Film-reel racks within the room shall be of non-combustible material, and shall be divided by partitions of non-combustible material equivalent to 10-millimetre asbestos-cement sheet, extending from the floor to the top of the rack.

(10) Any sections formed by the partitions referred to in subsection (9) shall be not more than 1 metre in width.

(11) Doors of the rooms shall be approved self-closing, swinging fire-doors having a fire-resistance rating of not less than one hour, which open outwards into a corridor or lobby provided with similar approved self-closing, swinging fire-doors, and the doors shall open easily from the inside.

(12) The words "FILM-STORE: NO SMOKING" shall be painted in block letters of not less than 100 millimetres in height on both sides of such doors, and a warning notice shall be affixed to, or painted on, the door, indicating the weight of film which may be kept therein.

(13) The corridors referred to in subsection (11) shall have the same construction as the rooms opening into them, and no door opening into such corridor shall be opposite any other such door.

(14) The corridor shall be served by at least two exit-ways, and shall be at least 1,12 metres in width.

(15) The ventilation of film-storage rooms shall comply with the following requirements—

(a) each room shall have an independent ventilation-opening to the open air, and corridors shall also be ventilated independently;

(b) the ventilation-opening from every room shall have a cross-sectional area of at least 0,1 square metre per each 500 kilograms or remaining part thereof of film for which the room is intended;

(c) terminal outlets to ventilation-openings shall be located above the roof of the room or shall face an open space, and be not less than 7,5 metres from any window opening or fire-escape.

(16) The electrical apparatus for a film-storage room shall comply with the following requirements—

(a) no electrical apparatus, other than that essential for lighting, shall be permitted within the film-storage room in which film is kept;

(b) lights shall be fixed at the ceiling with vapourproof fittings, and all wiring thereto shall be through seamless, screwed metal conduit;

(c) all switches, including those controlling thermostats for air-conditioning, shall be located outside such room, together with pilot-lights showing when the lights in such room are on.

(17) No heating of such rooms shall be allowed, nor shall heating-pipes be allowed to pass through such rooms.

DRY-CLEANING ROOMS

39. (1) *General.*—Every room used, or intended to be used, for gain or reward for the cleaning or treatment of garments, textiles or other such materials, with the aid of flammable liquids or substances (hereinafter referred to as a dry-cleaning room), shall comply with the requirements of this section.

(2) No dry-cleaning room shall be located in a basement or in any other place where the floor surface of such room is below the mean finished ground-level immediately surrounding such room, and no such room shall be used for any purpose other than that described in this section or purposes incidental thereto.

(3) Every wall, floor and ceiling of a dry-cleaning room shall be constructed of non-combustible materials having a fire-resistance rating of not less than two hours.

(4) *Doors and windows.*—Every door leading from a dry-cleaning room shall be a self-closing fire-door, and have a fire-resistance rating of not less than one hour.

(5) There shall be at least two such doors, opening outwards direct to the open air, hung to frames having a raised sill of concrete or other approved non-combustible material of not less than 150 millimetres in height.

(6) The fenestrations of such room shall provide openable windows having an aggregate area of not less than 10 *per centum* of the floor area of such room.

(7) All windows shall be glazed with wire-woven glass of not less than 6 millimetres in thickness.

(8) All doors and windows of such room shall be at least 4,5 metres from the nearest lateral boundary of the stand on which is erected the building in which such room is situate or from another building on the same stand.

(9) *Lighting and electrical equipment.*—All lighting and electrical equipment in a dry-cleaning room shall comply with the following requirements—

(a) no artificial lighting other than electric lighting shall be used;

(b) all electrical fittings and equipment shall be flameproof and vapourproof, and all wiring thereto shall be through seamless, screwed, metal conduit which shall be effectively bonded to earth;

(c) fuses and circuit breakers shall be located outside such room;

(d) one push-button switch, so constructed and connected as to provide means of stopping all machinery in case of an emergency, shall be provided in such room in an easily accessible position.

(10) *Motive power.*—Where any equipment is driven by means of shafting from motive power outside the dry-cleaning room, the driving-shaft shall pass through a gas-proof wall-box, which shall be installed at the point in the wall where such shafting enters such room.

(11) *Steam-supply system.*—Every dry-cleaning room shall be provided with a steam-supply system complying with the following requirements—

(a) steam shall be reticulated through steam-piping of not less than 25 millimetres in nominal bore provided with perforations or jets of not less than 6 millimetres in diameter;

(b) the piping shall be so disposed, and the perforations or jets so spaced, as to give, as far as practicable, a dispersion of steam sufficient to flood such room with steam within one minute, in the event of an outbreak of fire;

(c) a steam-trap, or other means of preventing the accumulation of water in such piping, shall be provided;

(d) an adequate steam-supply shall be maintained continuously while any flammable liquid is contained in any dry-cleaning equipment in such room;

(e) the boiler, or other equipment used for generating steam for a steam-supply system, shall be placed outside such room;

(f) the service-line of such system shall be provided with a stop-valve, situated outside such room, in an easily accessible position.

(12) *Ventilation.*—Every dry-cleaning room shall be ventilated by means of a mechanical system of exhaust and inlet ventilation of such design, construction and capacity as will adequately remove flammable liquid vapour from such room, and discharge such vapour into the air in such manner that it does not create a public nuisance, and shall comply with the following further requirements—

(a) such system shall cause the air in the room to be changed at least 30 times in every hour;

(b) the blades of all ventilating-fans shall be made of non-ferrous metal;

(c) all exhaust ventilation-ducts shall be installed with their lower edges not less than 150 millimetres and not more than 300 millimetres above the level of the floor and shall be as near as practicable to the points of origin of flammable liquid vapour emanating from the dry-cleaning equipment;

(d) fresh-air intakes shall be located not less than 2,1 metres above the level of the floor.

(13) *Signs.*—The words "DANGER: NO SMOKING", in block letters of not less than 150 millimetres in height, shall be conspicuously displayed outside and inside every entrance to every dry-cleaning room, and shall at all times be maintained in a legible condition.

SPRAY-ROOMS

40. (1) *General.*—Every room used or intended to be used for spraying, or otherwise applying cellulose or other flammable paints or lacquers or other volatile

flammable liquids (hereinafter referred to as a spray-room) shall be constructed in accordance with the requirements of this section.

(2) No such room shall be used for any purpose other than for such spraying.

(3) The walls, floor and ceiling-roof assembly of every spray-room shall be constructed of non-combustible materials, and have a fire-resistance rating of not less than two hours.

(4) Such walls, floor and ceiling-roof assembly shall be vapour-tight.

(5) The windows in a spray-room shall be non-opening fire-windows having a fire-resistance rating of not less than half an hour.

(6) The doorways and doors, whether internal or external, to a spray-room shall comply with the following requirements—

(a) there shall be not less than two doorways, which shall be separated by as great a distance as is practicable, and in any case by not less than half the length of the room;

(b) every doorway which is 1,1 metres or less in width shall be fitted with a swinging door opening outwards;

(c) every doorway which is more than 1,1 metres but not more than 2,4 metres in width shall be fitted with a sliding door;

(d) every doorway which is more than 2,4 metres in width shall be fitted with a roller-shutter: Provided that any doorway which is more than 3 metres in height shall be fitted with an approved automatic roller-shutter, irrespective of its width;

(e) every such swinging or sliding door shall be an approved self-closing fire-door having a fire-resistance rating of not less than one hour, and shall have an observation panel of not less than 300 millimetres square and of not more than 600 millimetres square, of clear wire-woven glazing having a fire-resistance rating of at least half an hour;

(f) every such door and shutter shall be kept closed at all times, except at such times as the door concerned is being used for the ingress or egress of goods or persons.

(7) No artificial illumination, other than electric lights, shall be used in a spray-room.

(8) All electrical fittings and apparatus in such room, or forming part of a ventilation system thereof, shall be flameproof and vapourproof, and all wiring thereto shall be through seamless, screwed, metal conduit, and shall be effectively bonded to earth.

(9) Fuses for electrical lighting and apparatus shall be located outside such room.

(10) Any artificial heating for a spray-room shall be by means of steam or hot water.

(11) Any boiler used to generate heat for this purpose shall be located outside such room.

(12) *Ventilation.*—Every spray-room shall have an effectual mechanical ventilation system which will extract the fumes from such room and discharge them in such manner that they do not create a public nuisance.

(13) Wherever practicable, such system shall take the form of an extraction-fan situated in an external wall of such room and discharging direct to the open air without the intermediary of a duct.

(14) Where this is impracticable, any extraction duct provided shall be of metal, shall be as short as possible, shall have no sharp bends and shall be taken through an external wall without passing through any other part of the building in which the spray-room is located.

(15) All fans shall be readily accessible, and ducts, if any, shall be fitted with doors for cleaning.

(16) Inlets for fresh air shall be provided, and shall be located not less than 2,1 metres above floor-level.

(17) The ventilating system for a spray-room shall be capable of providing a complete change of air in such room at least 30 times per hour.

(18) Notwithstanding the provisions of sub-section (17), where separate booths or similar enclosures exist within such room, it shall be permissible to provide not less than 30 complete air changes per hour only to each such booth or enclosure, if the spray-room, as a whole, is provided with extract ventilation at the rate of not less than 0,6 cubic metre of air per minute per square metre of floor area of such room.

(19) Not more than two such booths or enclosures shall be connected to a common fan or common exhaust-duct.

(20) If more than one fan is connected to a particular duct, the controls to such fans shall be so interconnected that one fan cannot be operated without simultaneously operating all fans connected to such duct.

(21) Except in the case of booths or similar enclosures, the inlets to extraction-fans or extraction-ducts shall be located not more than 450 millimetres above the floor-level of the spray-room.

(22) *Signs.*—Every door and roller-shutter in a spray-room shall be marked on both sides of such door or shutter in block letters of not less than 50 millimetres in height, stating: "THIS DOOR", or "THIS SHUTTER", as the case may be, "TO BE KEPT CLOSED WHEN SPRAYING IS IN PROGRESS" and shall at all times be maintained in a legible condition.

(23) At least one notice in block letters of not less than 150 millimetres in height, stating: "NO SMOKING", shall be painted on a wall of every spray-room and shall at all times be maintained in a legible condition.

(24) *Hand fire-extinguishers.*—Every spray-room shall be provided with an approved number of hand fire-extinguishers.

ROOMS CONTAINING HEATING APPLIANCES AND AIR-CONDITIONING APPLIANCES

41. (1) Subject to the provisions of subsection (9), every room in a building which—

(a) contains an air-conditioning plant or a boiler, furnace-incinerator or similar appliance in which heat is generated; and

(b) serves the whole or greater part of an occupancy-unit;

shall be separated from the remainder of the building by walls, floor and ceiling of non-combustible construction having a fire resistance rating of not less than one and a half hours:

Provided that, if such room contains a steam-boiler which operates at a pressure of more than 70 kilopascals with a rating of more than 7,5 kilowatts, such fire-resistance rating shall be not less than two hours.

(2) There shall be no openings in any such separating-walls, floors or ceilings, except through a lobby separating such room from the remainder of the building.

(3) Such lobby shall have walls, floor and ceiling with a fire-resistance rating equal to that of the walls, floor and ceiling of the room it serves.

(4) The doorways to such lobby and such room shall be protected by self-closing fire-doors having a fire-resistance rating of not less than one hour, and the doorway between such lobby and the remainder of such building shall be further protected by a fire-shutter having a fire-resistance rating of not less than one hour.

(5) Where the fuel used in the appliances mentioned in subsection (1) is a liquid fuel, every doorway in such room shall be provided with a raised sill high enough to form a well, which will contain, without leakage, the maximum amount of fuel kept in such room, plus 25 *per centum* of such amount.

(6) A heat-sensitive device shall be fitted close to the appliance and arranged to shut a fire-valve, installed in the fuel line(s) near the point of entry to the room, when the temperature in the vicinity of the appliance is within the range 68 degrees Celsius to 74 degrees Celsius. Where ambient temperatures may exceed 49 degrees Celsius the device may be set to operate at a maximum temperature of 93 degrees Celsius. The fire-valve(s) and associated parts shall comply with the requirements of B.S. 799.

(7) Every such room shall have not less than two alternative means of egress, as widely separated as possible, to an exit-way or street or public place.

(8) Every such room and lobby shall be provided with permanent means of ventilation, adequate to remove such products of combustion as may be emitted into such room, and so designed that the temperature of any combustible material adjacent to any appliance mentioned in subsection (1) will not exceed 80 degrees Celsius.

(9) The provisions of this section shall not apply to domestic cooking-stoves, fire-places, heaters or other such domestic appliances, or to electrode boilers.

(10) The installation of oil-fired equipment shall comply with B.S. C.P. 3002.

(11) The installation of domestic butane-gas or propane-gas burning-appliances shall comply with B.S. C.P. 339 or S.A.B.S. 087.

FLUES, CHIMNEYS AND SMOKE-STACKS

42. (1) *Flues.*—Every heat-generating appliance producing smoke or other noxious gases shall be provided with a flue complying with the following requirements—

(a) no flue shall have smoke-pipe connexions in more than one storey of a building, unless provision is made for effectively closing smoke-pipe openings with devices made of non-combustible materials whenever their use is discontinued temporarily;

(b) where a smoke-pipe is permanently in disuse, it shall be completely closed off with concrete, masonry or similar construction;

(c) two or more smoke-pipes shall not be joined for a single flue connexion, unless the smoke-pipes and flues are of sufficient size to serve all the appliances thus connected;

(d) the cross-sectional area of flues for appliances mentioned in this subsection which burn gas shall be not less than 10 square centimetres per hourly input of 12 megajoules, and in no case shall this cross-section be less than 75 millimetres in diameter;

(e) flues shall have cross-sectional areas at least equal to the aggregate areas of the smoke-pipes of the appliances connected to them.

(2) *Chimneys; general.*—All chimneys erected within, or attached to, a building or structure shall be constructed in accordance with the following requirements—

(a) chimneys shall be of, and be supported by, non-combustible construction;

(b) if chimneys are capped, such capping shall be of brick, terracotta, stone, cast iron, concrete or other approved non-combustible material;

(c) spaces between the chimney and joists, beams or girders, and between the chimney and any combustible materials, shall be fire-stopped by filling with non-combustible material;

(d) no change in the size or shape of a flue shall be made within a distance of 150 millimetres of any combustible ceiling or roof-member.

(3) *Chimneys for dwelling-houses and industrial low-heat appliances—particular requirements.*—Chimneys for dwelling-houses and industrial low-heat appliances shall comply with the following requirements in addition to those specified in subsection (2)—

(a) every chimney shall extend at least 600 millimetres above the highest point of the roof which is within a radius of 2,25 metres, measured horizontally from the nearest vertical surface of the chimney;

(b) chimneys for dwelling-houses shall be constructed of solid masonry-units, reinforced concrete or other approved non-combustible material;

(c) all walls of such chimneys built of masonry shall be properly bonded, or tied with corrosion-resistant metal anchors;

(d) in dwelling-houses not exceeding one storey in height, the thickness of the chimney-walls shall be not less than 100 millimetres, if lined as described in paragraphs (g) to (i), and 215 millimetres if not so lined;

(e) in other buildings and in dwelling-houses exceeding one storey in height, the thickness of such walls shall be not less than 215 millimetres;

(f) except in the case of chimneys having walls of at least 215 millimetres in thickness, serving dwelling-houses and other buildings appurtenant thereto, every chimney hereafter erected or rebuilt shall be lined with a flue-lining complying with paragraphs (g) to (i);

(g) flue-linings shall be made of fire-clay, refractory clay or any other approved refractory material which will withstand the action of flue-gases and resist, without softening or cracking, the temperatures to which they will be subjected, or of cast iron of approved quality, form and construction;

(h) flue-linings shall be not less than 12 millimetres in thickness;

(i) flue-linings shall start from a point not less than 230 millimetres below the intake, or, in the case of fire-places, from the throat of the fire-place and shall extend for the entire height of the chimney;

(j) soot-doors and frames for flues or fire-places shall be of cast iron arranged to remain tightly closed when not in use;

(k) when two or more flues are contained in the same chimney, each flue shall be separated from the others by masonry or concrete of at least 100 millimetres in thickness bonded into the wall of the chimney;

(l) any joints in the flue-linings of adjacent flues shall be staggered at least 180 millimetres.

(4) *Incinerator-chimneys.*—Chimneys for incinerators shall comply with the following additional requirements, and shall extend to a height above the roof equal to that required by paragraph (a) of subsection (3) excluding toilet incinerators—

(a) *Incinerator-chimneys other than fuel-fired incinerators.*—Chimneys for incinerators, other than fuel-fired incinerators, erected in buildings of residential, institutional, place of worship, school or college, both residential or non-residential, or restaurant occupancy, shall be constructed as follows—

(i) when the grate area of the combustion-chamber does not exceed 0,85 square metre and the height of the building does not exceed three storeys, the thickness of the chimney-walls shall be not less than 100 millimetres and the flue shall be lined in accordance with the provisions of paragraphs (g) to (i) of subsection (3);

(ii) when the grate area of the combustion-chamber exceeds 0,85 square metre or the building exceeds three storeys in height, the chimney shall be constructed in accordance with the provisions of paragraph (b);

(b) *Fuel-fired incinerator-chimneys.*—Chimneys for fuel-fired incinerators shall be lined with refractory-brick lining of at least 114 millimetres in thickness laid in fire-clay mortar and extending to the top of the chimney or to a point not less than 12 metres above the roof of the combustion-chamber, whichever is the lower. The walls of the chimney, including the flue-lining, shall be not less than 215 millimetres in thickness.

(5) *Chimneys for industrial medium-heat appliances.*—Chimneys for industrial medium-heat appliances, other than incinerators, shall comply with the following requirements—

(a) every chimney shall extend to a height of not less than 3 metres above the highest point of any roof which is within a radius of 7,5 metres, measured horizontally from the nearest vertical surface of the chimney;

(b) if such chimneys are constructed of concrete, the concrete shall be reinforced, and the walls shall be not less than 230 millimetres in thickness and shall, in addition, be lined with not less than 114 millimetres of fire-brick laid in fire-clay mortar, and such lining shall start not less than 600 millimetres below the smoke-pipe entrance, and extend for a height of at least 7,5 metres above the smoke-pipe entrance.

(6) *Chimneys for industrial high-heat appliances.*—Chimneys for industrial high-heat appliances shall be built to comply with the following requirements—

(a) such chimneys shall be built with double walls, each single wall being of not less than 215 millimetres in thickness, with an adequately ventilated air-space of not less than 50 millimetres between them;

(b) such space shall be ventilated near the top and the bottom;

(c) the inside 114-millimetre thickness of the interior walls shall be of fire-brick laid in fire-clay mortar;

(d) such chimneys shall extend at least 6 metres above the highest point of any roof which is within a radius of 15 metres, measured horizontally from the nearest vertical surface of the chimney, and shall be covered on the top

with heavy wire netting or other approved spark-arrester;

(e) no woodwork or other combustible material or construction shall be erected or placed within 1 metre of any part of such chimney.

(7) *Fire-place hearths.*—Fire-place hearths shall be built in compliance with the following requirements—

(a) every fire-place shall have a hearth of brick, stone, tile or other approved non-combustible material supported on a fire-resistant slab or on masonry trimmer-arches;

(b) such hearth shall extend at least 450 millimetres outside of the chimney-breast and not less than 300 millimetres beyond each side of the fire-place opening along the chimney-breast;

(c) the combined thicknesses of hearth and supporting non-combustible construction shall be not less than 150 millimetres at any one point.

(8) *Smoke-stacks.*—Every smoke-stack shall comply with the following requirements—

(a) every smoke-stack shall be of adequate thickness to withstand all forces, including wind forces, to which it may be subjected, at stresses permitted by these by-laws, and, if of metal, shall be properly riveted or welded and, unless structurally self-supporting, shall be securely guyed or firmly anchored to, or otherwise supported by, the building or structure served by such stack;

(b) all metal-work shall be painted or galvanized or be of corrosion-resistant alloy;

(c) soot-doors shall be provided at the base of every such stack;

(d) all metal smoke-stacks used for industrial high-heat appliances shall be lined with 114-millimetre-thick fire-brick laid flat in fire-clay mortar, and such lining shall extend not less than 7,5 metres above the smoke-pipe entrance;

(e) smoke-stacks shall extend to a height of not less than the following—

(i) for dwelling-houses, industrial low-heat appliances and incinerators, the height set out in paragraph (a) of subsection (3);

(ii) for industrial medium-heat appliances, the height set out in subsection (5);

(iii) for industrial high-heat appliances, the height set out in subsection (6);

(f) exterior smoke-stacks, or parts of smoke-stacks, erected on the exterior of a building, shall have a clearance from the wall of not less than 115 millimetres. No such stack shall be nearer than 600 millimetres in any direction from a wall-opening, exit-way or fire-escape;

(g) interior smoke-stacks, or parts of smoke-stacks, erected within a building other than a one-storey building, shall be enclosed above the storey in which the appliance served by the stack is located, in walls of non-combustible construction having a fire-resistance rating of not less than one hour, with a space on all sides between the stack and the enclosing-walls sufficient to render the entire stack accessible for examination and repair;

(h) the enclosing-walls of interior stacks shall be without openings, except doorways equipped with approved self-closing fire-doors provided for inspection purposes;

(i) where such stack passes through a roof constructed of combustible material, it shall be protected by a sleeve of non-combustible material extending at least 230 millimetres above and below the roof construction, and providing a clearance all round between stack and sleeve of at least 40 millimetres or one-quarter of the external diameter of the stack, whichever is the greater;

(j) such sleeve shall ventilate to the open air above the roof.

(9) *Raising adjoining chimneys, smoke-stacks, et cetera.*—No person shall, without the consent of the local authority, erect, enlarge or raise a building so that a wall thereof extends above the top of a chimney or smoke-stack attached to an existing building, if such erection, enlargement or raising causes a contravention of the provisions of paragraph (a) of subsection (3) or of subsection (5), or of paragraph (d) of subsection (6), or of paragraph (e) of subsection (8), and such consent may be given on such terms and conditions as the local authority may consider reasonable.

(10) *Spark-arresters.*—Heavy wire netting or other approved spark-arresting appliances shall be fitted to every chimney, smoke-stack or flue where—

(a) the roofing material of the building concerned is of thatch, shingles or other combustible material; or

(b) the chimney, smoke-stack or flue serves an incinerator constructed for the burning of any product which may give rise to sparks; or

(c) the local authority is of the opinion, on reasonable grounds, that such chimney, smoke-stack or flue is likely to cause the outbreak of fire by the emission of sparks.

PARKING-GARAGES

43. Every parking-garage shall comply with the following requirements—

(a) every such garage forming part of a building used for an occupancy different from that of the garage shall be separated from the remainder of such building by one or more occupancy-separation structures having a fire-resistance rating of not less than that specified in Table XVIII;

TABLE XVIII

FIRE-RESISTANCE RATINGS FOR OCCUPANCY-SEPARATION STRUCTURES FOR PARKING-GARAGES

1	2
Floor area of garage, in square metres	Fire-resistance rating of structure
Not exceeding 250 . . .	2 hours
Exceeding 250	4 hours

(b) no door leading from a garage shall open direct into a room used for sleeping purposes;

(c) garages having a floor area exceeding 250 square metres shall comply with the following requirements—

(i) the floor shall be graded and drained to the satisfaction of the local authority;

(ii) no artificial illumination, other than electric light, shall be used in such garage;

(iii) at least one notice reading "NO SMOKING", in block letters of not less than 150 millimetres in height, shall be conspicuously exhibited in every such garage;

(iv) every such garage located in a basement of a building containing another occupancy-unit above such garage shall be provided with an approved sprinkler installation;

(d) ramps connecting floors of garages, and which do not form components of required exit-ways, need not be enclosed.

STORAGE OR KEEPING OF FLAMMABLE LIQUIDS AND SUBSTANCES

44. (1) Except as provided in this section, every room used for the storage or keeping of flammable liquids and substances shall be constructed as a separate building, which shall be distinct from any other building.

(2) If, in the opinion of the local authority, it is impracticable to construct a room for the storage or keeping of flammable liquids and substances as a separate building, such room may be constructed as part of a building, subject to the following conditions—

(a) such room shall be completely separated from the remainder of such building by walls having a fire-resistance rating of not less than four hours and by a ceiling constructed in the form of two parallel slabs of solid reinforced concrete of at least 100 millimetres in thickness, having a layer of asbestos of not less than 25 millimetres in thickness between such slabs;

(b) there shall be no openings whatsoever in such walls and ceiling;

(c) every such room shall have at least one external wall;

(d) every such room shall be on the ground storey, and shall have a solid floor of incombustible material laid directly on the ground;

(e) notwithstanding the provisions of paragraph (a) with regard to the construction of the ceiling, the roof of any such room not having another storey above it shall be of solid reinforced concrete of not less than 125 millimetres in thickness;

(f) not more than 900 litres of flammable liquids or more than 1,5 cubic metres, in the case of other flammable substances not being flammable liquids, shall be stored in such room;

(g) such room shall have no windows, but shall be ventilated by an approved mechanical ventilation system, if required by the local authority, or by air-brick openings, set in the exterior and interior faces of the external walls, in the ratio of 1 500 square centimetres for every 5 square metres or remaining part thereof of the floor area of such room;

(h) fifty *per centum* of such air-bricks shall be located in such walls immediately above the level of the door-sill or sills, and the remainder located as near to the ceiling-level as is practicable;

(i) the backs of all such air-bricks shall be covered with woven wire gauze of copper, brass or bronze, with an aperture size of not more than 0,71 millimetre, securely fixed to the air-bricks;

(j) every door to any such room shall comply with the following requirements—

(i) the door and the frame thereto shall be constructed of iron or steel of not less than 5 millimetres in thickness, so as to have a fire-resistance rating of not less than two hours;

(ii) the door shall overlap the frame by 50 millimetres on all sides, shall be close-fitted into the frame and shall be hung to open outwards;

(iii) if, in the opinion of the local authority, a steel door or frame is considered to be a contributory cause of ignition, a hardwood door and frame having a fire-resistance rating of not less than two hours may be fitted with an approved blast-wall erected in front of such door;

(iv) the doorway shall have a raised sill of sufficient height to form a well of sufficient capacity to enable it to contain the maximum amounts of liquids or substances to be stored or kept, plus 25 *per centum* of such amounts;

(v) in no case shall the sill mentioned in subparagraph (iv) be less than 150 millimetres in height;

(vi) both sides of the door shall bear the words "STORE FOR FLAMMABLES", in block letters of not less than 150 millimetres in height;

(k) any artificial lighting to such room shall be by electric light having vapour-proof light-fittings wired through screwed, seamless, steel conduit. Switches operating such lights shall be located outside such room. No other electrical apparatus shall be installed in such room;

(l) such room shall be used for no other purpose than for the storage or keeping of flammable liquids and substances.

WINDOWLESS BUILDINGS

45. (1) In any occupancy-unit in which there are no windows in external walls, the provisions of this section shall be observed except by written permission of the local authority under special circumstances.

(2) A mechanical system of ventilation shall be provided, complying with the requirements of Chapter 10.

(3) Where any ventilation-duct passes through a wall forming an occupancy-separation structure, such duct shall be fitted, at the point where it passes through such wall, with a damper or other shut-off device actuated by an automatic device, which will close the duct in the event of a rise in temperature above that at which such device is set.

(4) Every habitable room shall have at least one external wall, and in such wall there shall be provided at least one opening, closed by a panel which can be readily and rapidly opened from the inside.

(5) Such panels shall be in addition to the access openings required by subsection (6) of section 20, and shall have an equal minimum size and maximum height above floor-level to that required for such access openings, and every such panel shall be clearly marked, on its inner face, "OPENABLE", in block letters of not less than 150 millimetres in height.

(6) Where the external wall or walls of any habitable room have a length exceeding 12 metres, there shall be one such panel for each 12 metres, or remaining part thereof, of such length, and the distance between such panels shall not exceed 12 metres.

(7) All interior wall-linings shall be of non-combustible material or other material as may be approved by the local authority in certain circumstances.

(8) Every habitable room shall have at least one doorway giving access to an exit-way, and every such doorway shall be served by not less than two separate exit-ways.

(9) Every room shall be regarded as having a fire-load of not less than moderate fire-load for the purposes of subsections (13) and (14) of section 24.

(10) All connexions for fire-hoses, hose-reels and all similar equipment shall be sited in readily accessible positions.

(11) There shall be provided an automatic fire detection and alarm system, and, where required by the local authority, an approved automatic fire-extinguishing system.

SPECIAL FLOORS IN OPERATING-THEATRES AND SIMILAR PLACES

46. Any rooms in hospitals, nursing-homes and similar places, such as operating-theatres or delivery-rooms, in which explosive gas is used or stored, shall have non-sparking conductive floors complying with the particulars of S.A.B.S. 051, Prevention of explosive and electrical hazards in hospitals.

VENTILATION INSTALLATIONS AND ROOMS HAVING HAZARDOUS DUSTS AND VAPOURS

47. (1) Every mechanical ventilation installation and air-conditioning installation in a building shall be so designed and constructed as to eliminate the possibility of fire or smoke being conveyed from one side of an occupancy-separation structure to the other side thereof.

(2) No duct shall pass through a division-wall or a division-floor.

(3) The ducting and any internal linings thereof, or external covering thereto, in any such installation shall be of non-combustible materials, and shall be so designed and constructed that no dust, fluff or other finely divided solid material or liquid can accumulate or be retained therein.

(4) Every room in a building in which there is an accumulation of dust, fumes, vapours or other noxious impurities, to such an extent as to create a fire-hazard, shall be provided with an approved system of ventilation.

(5) Such system shall be independent of any other ventilation system in the same building.

NOTICES IN OCCUPANCY-UNITS HAVING A HIGH FIRE-LOAD

48. In every occupancy-unit of a business, commercial or industrial occupancy or a storage occupancy, having a high fire-load, a permanent notice shall be displayed to this effect.

PART V

FIRE-EXTINGUISHING EQUIPMENT

ADMINISTRATIVE REQUIREMENTS FOR FIRE-EXTINGUISHING EQUIPMENT

49. (1) Plans and details showing the type and location of all fire-extinguishing equipment and

associated fittings in any building shall be submitted to the local authority before installation, and no installation of such equipment shall be commenced until the approval of the local authority has been obtained.

(2) Where, in the opinion of the local authority, the provision of fire-extinguishing equipment in any building erected before the promulgation of this Chapter is inadequate, the local authority may serve a written order upon the owner of such building, calling upon him to install within a reasonable time, to be specified in such order, such fire-extinguishing equipment, which shall likewise be specified in such order, as it may consider necessary to bring such building into conformity with the provisions of this Chapter relating to such equipment.

(3) The owner or occupier of any building to which the provisions of this Chapter apply, whether such building was erected before or after the promulgation of this Chapter, shall maintain all fire-extinguishing equipment in good and proper working order at all times, and shall cause all such equipment to be inspected at least once every 12 months by persons qualified by training and experience to do so.

(4) The local authority may require evidence of acceptable training or experience to be provided by an inspector referred to in subsection (3) before accepting that he is qualified for such work.

(5) The local authority shall be entitled to inspect all fire-extinguishing equipment installed in any building, and may order such equipment to be tested.

(6) Any such equipment found after test to be defective and beyond repair shall be immediately replaced.

TYPE AND DISPOSITION OF FIRE-EXTINGUISHING EQUIPMENT

50. (1) Fire-extinguishing equipment required by this Chapter shall include the types of equipment specified in the following list, and any one type of equipment shall be deemed to be less effective than any type which appears lower down in the list—

(a) hand extinguishers;
(b) fitted hose-reels;
(c) landing-valves;
(d) sprinklers:

Provided that approval may be given by the local authority to any other automatic extinguishing system.

(2) All fire-extinguishing equipment and associated fittings required by this Part shall be of approved pattern, manufacture and installation.

(3) Booster-pump connexions and hydrant connexions provided for use by the local authority shall be of a type and size specified by the local authority.

(4) A pressure-gauge, no less than 100 millimetres in diameter indicating the pressure, shall be fixed on all fire-extinguishing systems inside the premises of the consumer.

(5) Subject to the provisions of subsection (9), every storey of a building shall be provided with a type of fire-extinguishing equipment not less effective than the type specified in column 4 of Table XIX against the relevant occupancy, height of floor of storey above ground-floor level and gross floor area of such storey.

(6) Where hose-reels or landing-valves are prescribed in this section for certain storeys, and, where the water-supply required to meet the requirements of such equipment cannot be provided, the local authority shall stipulate the extent to which alternative equipment shall be provided, and the details of such alternative equipment.

(7) Wherever subsection (5) prescribes that any storey of a building shall be provided with fire-extinguishing equipment of a more effective type than that prescribed for any other storey of such building, the whole of such building shall be provided with fire-extinguishing equipment of such more effective type:

Provided that—

(i) where a building is divided into divisions, each such division shall be deemed to be a separate building; and

(ii) where a portion of a storey is used for a purpose ancillary to its main purpose, such ancillary purpose may, if in the opinion of the local authority it is not calculated to jeopardize life or property, be disregarded.

(8) Where subsection (5) requires the provision of any fire-extinguishing equipment on any storey of a building, it shall be permissible to provide equipment of a more effective type.

(9) The following buildings or occupancy-units[4] shall be provided with approved sprinkler installations and hand extinguishers or an alternative drencher system approved by the local authority—

(a) every basement which is a high or moderate fire-load occupancy-unit and having a floor area exceeding 250 square metres;

(b) every garage, other than an open-air garage, in a building which does not contain another occupancy-unit, and which has an aggregate floor area exceeding 1 000 square metres;

(c) every occupancy-unit having a high fire-load and a height of more than two storeys, and in which the aggregate floor area exceeds—

(i) 1 000 square metres, if the construction is grade A construction; or

(ii) 750 square metres, if the construction is grade B construction;

(d) notwithstanding the provisions of paragraphs (a) to (c), every occupancy-unit having a high fire-load, where the local authority considers on reasonable grounds that the risk of an outbreak of fire or its spread is exceptionally high or that such spread would otherwise be exceptionally difficult to control.

[4] As to stages and film-stores, see paragraph (j) of subsection (6) of section 36 and subsections (6) to (8) of section 38. As to garages in basements, see subparagraph (iv) of paragraph (c) of section 43.

TABLE XIX

REQUIRED FIRE-EXTINGUISHING EQUIPMENT

1	2	3	4
Occupancy of storey	Height of floor of storey above ground-floor level, in metres	Gross floor area of storey, in square metres	Type of fire-extinguishing equipment required
Dwelling-houses	Any	Any	Nil
Residential, other than dwelling houses; institutional; offices	0–5,4	0–250	Nil
		251–500	Hand extinguishers
		501 or more	Fitted hose-reels
	5,5–10,9	Any	Fitted hose-reels
	11–29	Any	Landing-valves, fitted hose-reels and hand extinguishers
	30 or more	Any	Sprinklers or other approved automatic system throughout
Shops	0–5,4	0–125	Nil
		126–250	Hand extinguishers
		251–1 000	Fitted hose-reels
		1 001–3 700	Landing-valves, fitted hose-reels and hand extinguishers
		3 701 or more	Sprinklers throughout
	5,5–29	0–1 000	Fitted hose-reels
		1 001–3 700	Landing-valves, fitted hose-reels and hand extinguishers
		3 701 or more	Sprinklers or other approved automatic system throughout
	30 or more	Any	Sprinklers or other approved automatic system throughout
Public and assembly; business, industrial or commercial (other than offices or shops); storage	Any	Any	Such fire-extinguishing equipment as the local authority, having regard to the nature of the activity conducted or to be conducted on the premises, deems necessary for— (a) enabling a fire to be dealt with by the occupants of the building immediately upon its outbreak; and (b) facilitating the work of the fire-brigade upon its arrival at the premises

Note.—Landing-valves may be supplied by dry or wet rising mains, as provided by subsection (9) of section 53.

(10) Within the grounds of every permanent amusement-park or exhibition-ground there shall be provided hydrants, so placed that the jets from the fire-hose appurtenant thereto are able to reach every part of each building in such park or ground.

(11) In addition, hand fire-extinguishers shall, where required by the local authority, be placed in each such building.

HAND FIRE-EXTINGUISHERS

51. (1) Hand fire-extinguishers having not less than the following capacities shall be regarded as hand fire-extinguisher units for the purposes of subsection (2)—

(a) 9 litres for water and foam types; and
(b) 3,2 kilograms for carbon-dioxide type; and
(c) 4,5 kilograms for chemical dry-powder type; and
(d) 2,5 kilograms for liquid-vaporising type.

(2) Where hand fire-extinguishers are required to be provided in terms of this Chapter, they shall be provided at the rate of not less than one unit for every 250 square metres or remaining portion thereof of the floor area of the storey concerned, but no part of such floor area shall be further than 23 metres of direct-travel distance from a hand fire-extinguisher.

(3) Where the capacity of extinguishers provided is less than the capacity prescribed in subsection (1) for a hand fire-extinguisher unit, the number of such

extinguishers shall be increased, so as to provide the required aggregate capacity.

(4) Every hand fire-extinguisher required in terms of these by-laws shall be hung on a bracket and placed in a conspicuous position with the handle a maximum of one metre from the floor.

FITTED HOSE-REELS

52. (1) Every hose-reel shall—

(a) be to the approval of the local authority and fitted with hose complying with the requirements of C.A.S. 183, Fire hose reels; and

(b) be fitted with a nozzle having an internal diameter of 4,8 millimetres, which nozzle shall have a shut-off valve:

Provided that where, in the opinion of the local authority, the delivery of water through a hose of an internal diameter of not less than 19 millimetres would be inadequate to deal effectively with an outbreak of fire in the immediate vicinity of a hose-reel, the local authority may require the hose and the nozzle outlet to have internal diameters of not less than 25 millimetres and 6,4 millimetres, respectively.

(2) Hose-reels shall be provided at the rate of not less than one reel for every 420 square metres, or remaining portion thereof, of the floor area of the storey concerned, but every such reel shall be so located that all parts of such floor area can be reached by a jet of water from the hose with which it is fitted.

(3) The water-supply to all hose-reels may be fed from the domestic water-supply to the occupancy-unit served by them, or may be fed from a tank having a capacity of not less than 450 litres, or may be connected to a hydrant supply-pipe.

(4) At the hose-reel which is farthest away from the street-main, there shall be a minimum pressure of 70 kilopascals at all times when the nozzle shut-off valve is fully open.

(5) Where the water-supply to any of the hose-reels is not connected to a hydrant supply-pipe, and the pressure in such water-supply pipe is less than 140 kilopascals static pressure, a single-inlet fire-pump boosting-connexion, fitted with a reflux-valve and a pressure-gauge not less than 100 millimetres in diameter, reading up to 1 400 kilopascals, shall be provided in an approved position.

LANDING-VALVES

53. (1) Every landing-valve required by section 50 shall be an approved gun-metal, wheel-valve pattern landing-valve having an inlet for a supply-pipe of not less than 75 millimetres in internal diameter, and a female outlet of not less than 65 millimetres in diameter.

(2) Such wheel-valve shall have embossed or engraved thereon the word "OPEN", and an arrow indicating the direction of rotation of the wheel to open the valve.

(3) Where such landing-valves are required to be provided in any storey, they shall be provided at the rate of not less than one landing-valve for every 600 square metres, or remaining portion thereof, of floor area of the storey concerned, but every such landing-valve shall be so located that all parts of such floor area can be reached by a jet from the hose with which it is provided.

(4) Where landing-valves are required to be provided in a building and to serve any storey at a greater height above ground-floor level than 11 metres, a twin-inlet fire-pump boosting-connexion, fitted with a reflux-valve and a pressure-gauge not less than 100 millimetres in diameter, reading up to 1 400 kilopascals, shall be provided within 1 metre of the finished ground-level in an approved position on an external wall of such building.

(5) The water-supply pipe to every such landing-valve shall have a nominal bore of not less than 80 millimetres, and be independent of the domestic water-supply to the occupancy-unit served by it, and shall be connected directly to a water-main of the local authority.

(6) Every building exceeding 18 metres, but less than 30 metres in height, in which such landing-valves are provided, shall have a water-storage tank or interconnected tanks of an aggregate capacity of not less than 6 cubic metres, in addition to any domestic reserve, if there are one or two landing-valves in each storey, or not less than 9 cubic metres, if there are more than two landing-valves in each storey.

(7) The bottom of any water-storage tank referred to in subsection (6) shall be—

(a) not less than 4,5 metres above the level of the highest landing-valve in the topmost storey of such building, and shall be connected to the landing-valve supply-pipe through a pipe having a minimum nominal bore of 80 millimetres and fitted with a stop-valve and a reflux-valve; or

(b) above the ceiling of the topmost storey or above the eaves-level of such building, and shall be directly connected through a pipe, having a minimum nominal bore of 80 millimetres, to the fire-pump boosting-connexion mentioned in subsection (4).

(8) Such tank or tanks shall be filled through a pipe, having a minimal bore of 20 millimetres, connected to the landing-valve supply-pipe and fitted with a stop-valve and a high-pressure ball-valve.

(9) As an alternative to wet rising mains, the local authority may require dry rising mains fitted with fire-brigade inlets and approved outlets, which shall comply with subsection (1) and be provided at the same rate as required in subsection (3).

SPRINKLERS

54. (1) A sprinkler installation required in terms of this Chapter shall be designed and installed in accordance with the Rules for Automatic Sprinkler Installations, published by the Fire Officers' Committee (Foreign).

(2) Unless a duplicate supply from a separate water-main is provided for a sprinkler installation, the consumer shall install a tank at such an elevation as will compensate for any cessation or variation of

pressure in the local authority's water-mains and where necessary install a pump to provide and maintain required pressure to the sprinkler installation.

(3) The main pipe leading from tank to sprinkler installation may be in direct communication with the water-mains:

Provided that in such case the main pipe shall be fitted with a reflux-valve, which will close against the pressure of the water-main and open to the pressure of the tank, should the pressure in the water-main not be available from any cause.

(4) An overflow pipe shall be fitted to such tank, which pipe shall discharge in such a position as to be readily observable, and shall not be led away to any down-pipe to any drain.

(5) Where a duplicate supply from a separate water-main is provided, each supply-pipe shall be fitted with a reflux-valve fixed inside the premises.

(6) When ready for service, such sprinkler installation shall be inspected and tested by the local authority at the expense of the owner concerned, and any defects revealed by such inspection and test shall be remedied before approval for its use is given.

PART VI

WATER-SUPPLY FOR FIRE-FIGHTING SERVICES

SPECIAL CONDITIONS

55. The provisions of Chapter 7 shall, *mutatis mutandis*, apply to the supply of water for fire-fighting services.

CONNEXION FROM COMMUNICATION-PIPES

56. No branch connexion of any kind from a communication-pipe intended for preventive or automatic use in case of fire, where unmetered, shall be made, other than a branch connexion in connexion with an automatic sprinkler, drenchers, landing-valve connexion or a connexion to the pressure-tank upon the top of the building, and the discharge from the last-mentioned connexion shall be controlled by a suitable ball-valve.

VALVES IN COMMUNICATION-PIPES

57. Every communication-pipe for fire-fighting equipment shall be fitted with an approved sluice-valve, and shall be—

(a) supplied by the local authority at the expense of the consumer;

(b) of the same nominal diameter as the communication-pipe;

(c) placed in such position as may be determined by the local authority.

INSTALLATION OF REFLUX-VALVE

58. In all private installations where a fire-pump connexion is installed, a reflux-valve shall be installed between the boundary of the premises and the fire-pump connexion, in order to close off the supply from the local authority's mains when the fire-pump connexion is being used.

EXTENSION OF SYSTEM TO OTHER PREMISES

59. No extension or connexion from any fire-fighting equipment to premises, other than those for which it was approved, shall be made, and, in the event of any such extension or connexion being made, the local authority shall be entitled to enter upon any premises and take all steps necessary to disconnect such connexions at the cost of the person responsible for such extension or connexion.

DETAILS OF CONNEXION

60. The consumer shall be responsible for ensuring that the water supply provided in respect of any fitted hose-reel or landing-valve, or sprinkler installation, in any building shall comply with the relevant provisions of Part V.

PART VII

GENERAL

LOCAL AUTHORITIES WHICH ARE CURRENTLY WITHOUT FIRE-FIGHTING SERVICES

61. Where the local authority does not have fire-fighting services, any requirements laid down in this Chapter relating to such services shall not apply to any building within the local authority area until these services are provided and the local authority has given adequate notice to the owner of the building to take such steps as are necessary to comply with the relevant provisions.

FIRST SCHEDULE (*Sections 1 and 2*)

FIRE-RESISTANCE TESTS OF STRUCTURES

(based on I.S.O. recommendation R 834)

This test provides for the determination of fire resistance of elements of structure on the basis of the length of time for which the test specimens, of specified dimensions, satisfy the criteria laid down under the prescribed test conditions.

FIELD OF APPLICATION

1. (1) This test is intended to determine the fire resistance of the following elements of structure—

(a) load-bearing and non-load-bearing walls, partitions;

(b) columns;

(c) beams;

(d) floors;

(e) flat roofs (where appropriate).

(2) Elements which fall into none of these categories may be tested by analogy with a similar element.

APPARATUS

2. (1) *Furnace.*—The furnace should be capable of subjecting a specimen element to the standard heating conditions specified below.

(2) *Standard heating conditions.*—The temperature within the furnace should be controlled so as to vary with time within the limits specified in subparagraph (9), according to the following relationship—

$$T - T_0 = 345 \log_{10}(8t + 1)$$

where

t = the time, expressed in minutes;

T = the furnace temperature at time t, expressed in degrees Celsius;

T_0 = the initial furnace temperature, expressed in degrees Celsius.

(3) The curve representing the function described in subparagraph (2) is named the "standard time–temperature curve", as shown in the Figure.

(4) The relationship expressed in subparagraph (2) gives the values shown in the Table.

TABLE

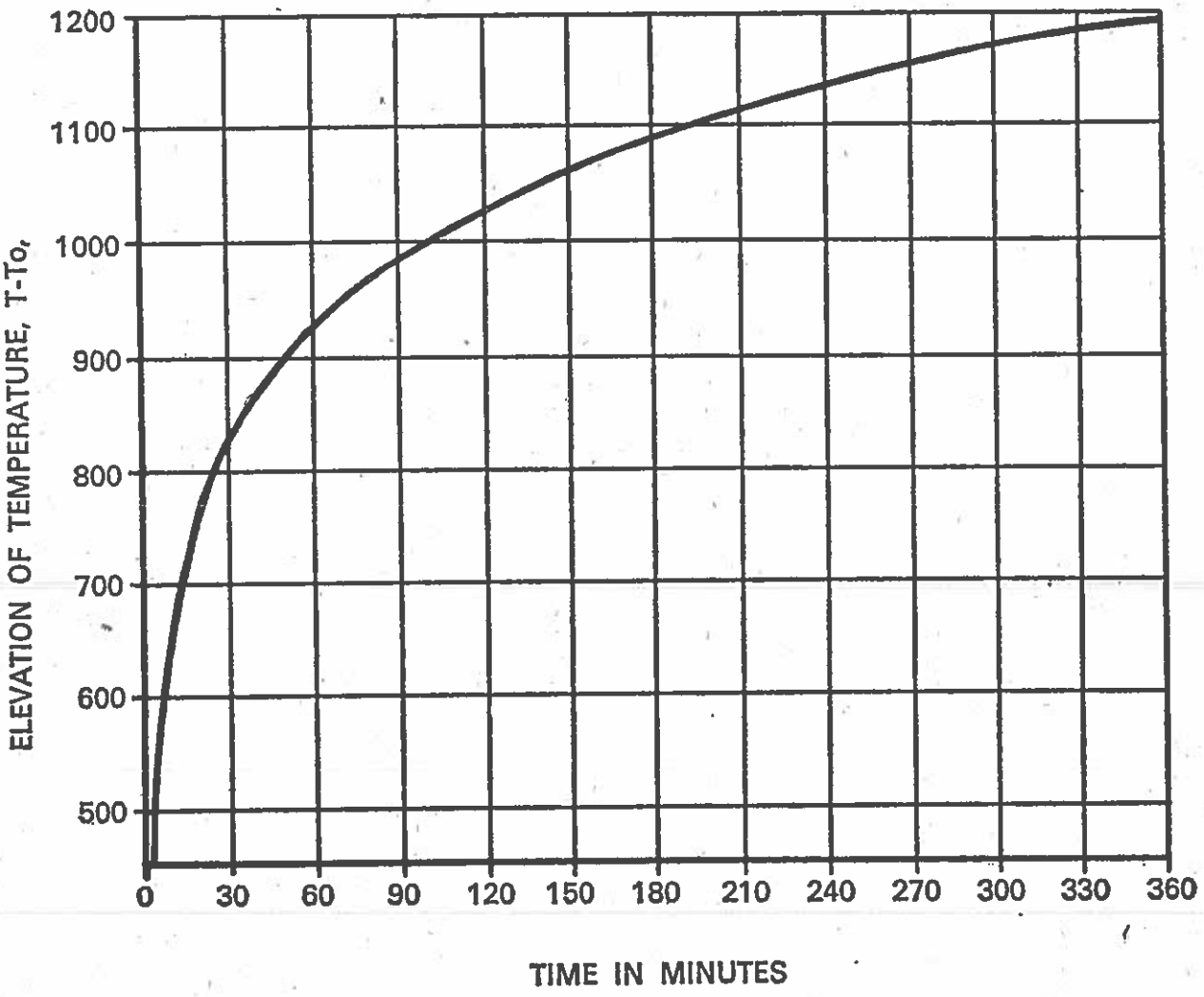
TEMPERATURE RISE AS A FUNCTION OF TIME

1	2
Time t, in minutes	Elevation of furnace temperature, $T - T_0$
	Degrees Celsius
5	556
10	659
15	718
30	821
60	925
90	986
120	1 029
180	1 090
240	1 133
360	1 193

(5) *Measurement of furnace temperature.*—The furnace temperature is deemed to be the average of the

FIGURE

STANDARD TIME-TEMPERATURE CURVE



temperatures recorded by thermocouples, symmetrically arranged within the furnace to give an approximation of its average temperature.

(6) These thermocouples should not be fewer than—

(a) one to each 1,5 square metres of surface for walls and floors;

(b) one to each 1 metre of length for beams;

(c) two to each 1 metre of height for columns.

(7) Bare-wire thermocouples of not less than 0,75 millimetre in diameter should be arranged so that the hot junction is 100 millimetres from the nearest point of the test specimen. This distance should be kept as constant as possible during the test.

(8) The wires of the thermocouples should be placed in open tubes of heat-resisting material, for example, porcelain, within 25 millimetres of the hot junction.

(9) *Tolerances for furnace temperatures.*—The accuracy of the temperature control should be such as to satisfy the following two sets of tolerances for furnace temperatures—

(a) *Tolerances for mean deviation.*—The mean deviation of the furnace temperature as a percentage is given by the following expression—

$$\frac{A - B}{B} \times 100$$

where

A = the integral value of the average furnace temperature as a function of time;

B = the integral value of the function specified in subparagraph (2).

The tolerances on the mean deviations are as follows—

(i) ± 15 *per centum* during the first 10 minutes of test;

(ii) ± 10 *per centum* during the first half an hour of test;

(iii) ± 5 *per centum* after the first half an hour of test.

(b) *Tolerances for single average values.*—At any time after the first 10 minutes of test, the average furnace temperature should not differ from the corresponding temperature of the standard times temperature curve by more than ± 100 degree Celsius, even for combustible materials.

PREPARATION OF TEST SPECIMENS

3. (1) *Dimensions of test specimens.*—The test specimens should be full size wherever possible.

(2) Where this is not possible, the following minimum dimensions of the parts of a test specimen exposed in the furnace are recommended—

(a) walls and partitions: height, 2,5 metres; width, 2 metres;

(b) floors: span, 4 metres; width, 2 metres;

(c) beams: span, 4 metres;

(d) columns: height, 3 metres.

(3) *Construction of test specimens.*—The test should be made on a test specimen representative of a complete element of structure. For example, a partition should include at least one of each representative type of joint, as mentioned in subparagraphs (15) to (18) of paragraph 4. The methods of fixing and supporting the components and the finishes used should be as in service.

(4) The materials and standard of workmanship of the test specimen should be representative of those applying in good practice, as defined by existing codes and standards.

(5) *Conditioning of test specimens.*—The test specimen should be conditioned in such a way that it corresponds as closely as possible, in moisture content and mechanical strength, to the expected state of a similar element in service.

(6) *Moisture content.*—The test specimen should not be tested until its moisture content is in equilibrium with an ambient atmosphere approximating to that expected in service. This equilibrium may be checked either on the test specimen itself or on a representative sample.

(7) The drying of the test specimen may be by natural or artificial means, but a temperature should not be reached which could impair the fire-resisting properties of the element. It is recommended that a temperature of 60 degrees Celsius should not be exceeded.

(8) *Mechanical strength.*—For load-bearing elements, the constituent materials of the specimen should have attained a mechanical strength close to that expected for a similar element in service.

PROCEDURE, CONDITIONS OF TEST, AND RESTRAINT AND LOADING

4. (1) The role of the element in service should be analysed so that the methods adopted for supporting or restraining the ends or sides of a test specimen during a test are, as far as possible, similar in nature to those which would be applied to a similar element in service.

(2) For floors and beams with uncertain or variable boundary service conditions, the test specimen should be simply supported all round the edges or at the ends.

(3) Before heating, a load-bearing test specimen should be subjected to a loading which produces stresses of the same magnitude as would be produced normally in the full-size element when subjected to the design load.

(4) The loading should be maintained constant during the test period.

(5) Test specimens of non-load-bearing elements should not be loaded during test.

(6) *Exposure in furnace.*—Free-standing columns should be tested by applying heat on all sides over their whole height.

(7) Separating-elements represented by test specimens of elements which have the function of separating-spaces should be heated over the whole of one face only.

(8) Those which may be required to resist fire in one direction only should be tested in that direction.

(9) Those which may be required to resist fire from either direction should be tested in the direction considered to give the lower resistance by the testing authority.

(10) In cases of doubt, each face should be tested on separate test specimens.

(11) *Observations during test.*—During a test, the deformation of the test specimen should be measured, and note should be made of the moment when collapse takes place.

(12) *Stability.*—For a load-bearing test specimen, the time at which it can no longer support the test load should be noted.

(13) *Integrity.*—Observations should be made of cracks, holes or other openings through which flames or gases could pass in a test specimen of a separating-element.

(14) When there is doubt about the ability of flames or hot gases to pass through such openings, a pressure difference should be created, so that the furnace pressure exceeds the pressure on the unexposed face by 15 ± 5 pascals or $1{,}5 \pm 0{,}5$ millimetre H_2O and observations made of the ignition of a pad of cotton wool held 20 to 30 millimetres from the opening on the unexposed side, indicating the emission of hot gases.

(15) *Insulation: average temperature of unexposed face.*—In the case of elements with an unheated surface, the temperature of the unexposed face should be measured by means of not less than five thermocouples, one placed approximately at the centre of the face and the others approximately at the centres of the straight lines joining the centre and the corners.

(16) Any points of measurement additional to these five thermocouples should be disposed as uniformly as possible over the unexposed face of the specimen.

(17) In the case of structures comprising composite elements, the arrangement of the test specimen should ensure that the joints do not coincide with the points of measurement specified above.

(18) The average of the temperatures measured at the points specified above, omitting temperatures measured at joints, is deemed to be the temperature of the unexposed face.

(19) *Insulation: maximum temperature of unexposed face.*—In addition, the temperature should be measured at the point which appears to be the hottest at any time during the test.

(20) This temperature should not be used in the calculation of average temperature, but should be taken into account in determining whether the maximum temperature criterion has been complied with.

(21) *Temperature measurement.*—Surface temperatures are measured by means of thermocouples with a wire-diameter of 0,5 millimetre.

(22) Each thermocouple junction should be attached to the centre of the face of a copper disc 12 millimetres in diameter and 0,2 millimetre in thickness, which is secured to the surface of the specimen at the required position.

(23) The discs should be covered with oven-dry, square asbestos pads 30 millimetres square and 2 millimetres in thickness.

(24) The disc and the pad may be fixed to the surface of the specimen by pins, tape or a suitable adhesive, depending on the nature of the material forming the side of the specimen.

(25) *Additional observations.*—Throughout the test, observations should be made of all changes and occurrences which are not criteria of performance, but which could create hazards in a building, for example, the emission of appreciable volumes of smoke or noxious vapours from the unexposed side of a separating-element.

(26) *Duration of test.*—The test specimen should be heated in the prescribed manner, normally until failure occurs under any one of the relevant test requirements, namely—

(a) stability, as prescribed in subparagraph (1) of paragraph 6;

(b) integrity, as prescribed in subparagraph (2) of paragraph 6;

(c) insulation, as prescribed in subparagraph (4) of paragraph 6.

(27) In tests other than those on test specimens judged only by the criterion of stability, as prescribed in subparagraph (1) of paragraph 6, the testing may be continued after failure under either of the other two conditions, as prescribed in subparagraphs (2), (3) and (4) of paragraph 6, by prior agreement between the sponsor of the test and the testing authority until failure occurs under the other condition, provided collapse of the specimen has not already occurred.

(28) Alternatively, the test may be concluded after a period determined by prior agreement between the sponsor and the testing authority, even if no failure under any of the conditions has occurred at the end of that time.

(29) The length of time from the commencement of heating for which the test specimen complies with the relevant requirement(s) should be expressed in hours and minutes.

EXPRESSION OF RESULTS

5. (1) *Fire resistance.*—The fire resistance of test specimens is the time, expressed in hours and minutes, from commencement of the test until failure occurs, under the conditions of stability, integrity and insulation, which are appropriate to the test.

(2) If more than one test specimen of the same element is tested, the result which should be taken is that which gives the shortest time of compliance with the test requirements.

CRITERIA OF FIRE RESISTANCE

6. (1) *Stability.*—For all elements of structure, it is required that the test specimen should not collapse in such a way that it no longer continues to perform the function for which it was constructed. The test specimen shall be deemed to have failed when the maximum deflection exceeds L/30, where L = clear span.

(2) *Integrity.*—For elements of structure such as walls and floors which have the function of separating two parts of a building, the formation in the test specimen of cracks, holes or other openings through which flames or hot gases can pass should not occur.

(3) Failure of integrity should be deemed to have occurred when the pad of cotton wool specified in subparagraph (14) of paragraph 4 is ignited.

(4) *Insulation.*—For elements of structure such as walls and floors which have the function of separating two parts of a building, it is required—

(a) that the average temperature of the unexposed face of the specimen does not increase above the initial temperature by more than 140 degrees Celsius;

(b) that the maximum temperature at any point of this face should not—

(i) exceed the initial temperature by more than 180 degrees Celsius; and

(ii) exceed 220 degrees Celsius, irrespective of the initial temperature.

SECOND SCHEDULE (*Sections 2 and 18*)

PRESUMED FIRE-RESISTANCE RATINGS OF BUILDING-COMPONENTS[6]

1. Every component or assembly of components of a building described in the tables contained in this Schedule shall be presumed to have the fire-resistance rating given in the tables for the component or assembly of components indicated, unless the contrary is proved by the test described in the First Schedule.

2. In this Schedule, the following classification of aggregates and interpretation of abbreviations shall apply—

"Class 1 aggregate" means coarse aggregate of foamed slag, pumice, blast-furnace slag, well-burned clinker, crushed limestone and crushed brick and crushed burnt-clay products, including expanded clay used as coarse aggregate;

"Class 2 aggregate" means coarse aggregate of flint, gravel, granite and all crushed natural stones other than limestone, used as coarse aggregate;

"CS" means cement-sand plaster of a thickness, subject to any express provision to the contrary, of not less than 12 millimetres;

"GS" means gypsum-sand plaster of a thickness, subject to any express provision to the contrary, of not less than 12 millimetres; and

"VG" means vermiculite-gypsum plaster of a mix having proportions of vermiculite to gypsum within the range 1½:1 and 2:1 by volume, and of a thickness, subject to any express provision to the contrary, of not less than 12 millimetres.

[6] These Tables are not exhaustive. Refer to section 2 for materials not included in the following Tables on fire-resistance ratings.

TABLE I

BEARING-WALLS: FIRE-RESISTANCE RATINGS

Note.—In this Table, any reference to plaster means plaster applied to that side of the wall in relation to which the wall is required to have a specified fire-resistance rating.

1	2	3	4	5	6
Construction and materials	Minimum thickness, in millimetres, excluding plaster, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
Solid construction					
Bricks of clay, concrete or sand-lime—					
Unplastered	215	100	100	100	100
Plastered with VG	100	100	100	100	100
Solid concrete blocks—					
Class 1 aggregate—					
Unplastered	150	100	100	100	100
Plastered with VG	100	100	100	100	100
Class 2 aggregate—					
Unplastered	—	100	100	100	100
Plastered with VG	100	100	100	100	100
Reinforced concrete with minimum cover to reinforcement of 25 millimetres—					
Unplastered	180	100	100	75	75
Plastered with CS	180	100	75	75	75
Plastered with GS	180	100	75	75	75
Plastered with VG	125	75	75	75	75

TABLE II

NON-BEARING-WALLS AND PARTITIONS: FIRE-RESISTANCE RATINGS

Note.—In this Table, any reference to plaster means, unless the contrary is expressed, plaster applied on that side of the wall or partition in relation to which the wall or partition is required to have a specified fire-resistance rating, and any entry "Nil" in a column means that no plaster is necessary.

1	2	3	4	5	6
Construction and materials	Minimum thickness, in millimetres, excluding plaster, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
Solid construction					
Bricks of clay, concrete or sand-lime—					
Unplastered	170	100	100	100	100
Plastered with VG	100	100	100	75	75
Solid-concrete blocks—					
Class 1 aggregate—					
Unplastered	150	75	75	75	50
Plastered with CS	100	75	75	75	50
Plastered with GS	100	75	75	50	50
Plastered with VG	75	75	65	50	50
Class 2 aggregate—					
Unplastered	150	100	100	75	50
Plastered with CS or GS	150	100	100	75	50
Plastered with VG	100	75	75	75	50
Hollow concrete blocks, one cell in wall thickness—					
Class 1 aggregate—					
Unplastered	150	110	110	110	75
Plastered with CS or GS	150	110	110	75	75
Plastered with VG	110	75	75	65	65
Class 2 aggregate—					
Unplastered	150	150	125	125	125
Plastered with CS or GS	150	150	125	100	100
Plastered with VG	125	100	100	100	75
No-fines concrete, Class 2 aggregate, plastered with CS or GS	150	150	150	150	150
Wood-wool slabs, plastered on both sides with CS or GS	—	75	75	50	50
Compressed-straw slabs with wood cover-strips of not less than 75 millimetres in width and 12 millimetres in thickness over joints	—	—	—	—	50
Cavity construction					
Cavity-wall consisting of inner and outer leaves of bricks or blocks of clay, concrete or sand-lime, the outer leaf being not less than 100 millimetres in thickness and the inner leaf of thickness of	100	75	75	75	75
Hollow stud construction of steel or timber studs, and on each side—					
Expanded metal with CS or GS to a thickness of	—	—	—	20	12
Expanded metal with VG to a thickness of	—	25	20	12	12
Plaster-board of not less than 10 millimetres in thickness with GS to a thickness of	—	—	—	12	5
Plaster-board of not less than 12 millimetres in thickness with GS to a thickness of	—	—	—	10	Nil
Plaster-board of not less than 20 millimetres in thickness, in one or two layers, with VG to a thickness of	—	16	16	Nil	Nil
Perforated plaster-board of not less than 10 millimetres in thickness with CS or GS to a thickness of	—	—	—	12	12
Perforated plaster-board of not less than 10 millimetres in thickness with VG to a thickness of	—	25	25	10	10

TABLE III

SUSPENDED CONCRETE FLOORS: FIRE-RESISTANCE RATINGS

Note.—In this Table, the entry "A" means sprayed asbestos having a density of not less than 145 kilograms per cubic metre, and any entry "Nil" in any column means that no ceiling finish is necessary.

1	2	3	4	5	6	7
Construction	Minimum thickness, including screed, in millimetres	Type of ceiling finish and minimum thickness, in millimetres, for fire-resistance rating 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	—	—	—	6VG	Nil
	100	20VG or 20A	6VG	6VG	Nil	Nil
	125	10VG or 12A	Nil	Nil	Nil	Nil
	150	Nil	Nil	Nil	Nil	Nil
Units of inverted U-section	65	—	—	—	—	Nil
	75	—	—	—	Nil	Nil
	100	—	Nil	Nil	Nil	Nil
	150	Nil	Nil	Nil	Nil	Nil
Hollow block construction or units of box or I-section	65	—	—	—	—	Nil
	75	—	—	—	Nil	Nil
	90	—	Nil	Nil	Nil	Nil
	125	Nil	Nil	Nil	Nil	Nil

TABLE IV

SUSPENDED CEILINGS: FIRE-RESISTANCE RATINGS

1	2	3	4
Construction and materials	Minimum thickness, in millimetres, for fire-resistance rating of—		
	2 hours	1 hour	½ hour
Thickness of plaster (cement/lime/sand or sanded-gypsum mix) on expanded metal	—	22	16
Thickness of vermiculite/gypsum plaster on expanded metal (1½:1 mix)	20	12	12
Thickness of vermiculite/gypsum plaster on 10-millimetre plaster lath	—	12	12
Precast vermiculite slabs	40	25	25

TABLE V

TIMBER FLOORS: REQUIRED CONSTRUCTION FOR FIRE RESISTANCE RATING OF HALF AN HOUR

Note.—In this Table, any entry "Nil" means that no ceiling finish is necessary.

1	2	3	4
Minimum width of joist, in millimetres	Minimum thickness of tongued-and-grooved boarding, in millimetres	Type of ceiling base	Minimum thickness, in millimetres, of ceiling finish consisting of CS or GS
38	18	Asbestos insulation board of not less than 10 millimetres in thickness	Nil
		Plaster-board of not less than 10 millimetres in thickness	12
		Plaster-board of not less than 12 millimetres in thickness	5
		Plaster-board of not less than 20 millimetres in thickness (in one or two layers)	Nil
		Wood-wool slab of not less than 25 millimetres in thickness	5
		Metal lath	16
50	20	Asbestos insulation board of not less than 6 millimetres in thickness	Nil
		Fibre insulation board of not less than 12 millimetres in thickness	12

TABLE VI

PROTECTION FOR ENCASED STEEL STANCHIONS AND BEAMS

Notes.—In this Table—

"Solid protection" means casing which is bedded close up to the steel without any intervening cavities, and with all joints in that 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;

"Reinforcement". Where reinforcement is required by this Table, that reinforcement shall consist of steel binding-wire of not less than 2,5 millimetres or a steel mesh having a mass of not less than 0,54 kilogram per square metre. In concrete protection, the spacing of that reinforcement shall not exceed 300 millimetres in any direction.

1	2	3	4	5	6
Construction and materials	Minimum thickness of protection, in millimetres, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
Solid protection for stanchions—					
Reinforced; concrete not less than Grade 20 with natural aggregates					
(a) concrete not assumed to be load-bearing	50	25	25	25	25
(b) concrete assumed to be load-bearing	75	50	50	50	50
Solid bricks of clay or sand-lime	75	50	50	50	50
Solid blocks of foamed slag concrete or pumice concrete reinforced in every horizontal joint	65	50	50	50	50
Sprayed asbestos having a density of not less than 145 kilograms per cubic metre	45	20	15	10	10
Sprayed vermiculite-cement	—	40	30	20	12
Hollow protection for stanchions—					
Solid bricks of clay or sand-lime reinforced in every horizontal joint	115	50	50	50	50
Solid blocks of foamed slag concrete or pumice concrete reinforced in every horizontal joint	75	50	50	50	50
Metal lath plastered with CS or GS of thickness of	—	*40	25	20	12
Metal lath plastered with VG or perlite-gypsum plaster of thickness of—					
(a) not spaced out from flanges of stanchion	*50	20	15	12	12
(b) spaced 25 millimetres from flanges	45	20	12	12	12
Gypsum plaster-board with 1,6-millimetre wire-binding at 100-millimetre pitch, plastered with VG of thickness of—					
(a) plaster-board of not less than 10 millimetres in thickness	—	15	12	10	6
(b) plaster-board of not less than 20 millimetres in thickness (in one or two layers)	*32	10	10	6	6
Metal lath with sprayed asbestos of thickness of	45	20	15	10	10
Vermiculite-cement slabs (four parts of vermiculite to one part of cement) reinforced with wire mesh and plastered with CS or GS skim-coat—thickness of slabs	65	25	25	25	25
Asbestos insulation board of thickness of	—	†25	†20	†12	†10
Hollow protection for beams—					
Metal lath plastered with GS of thickness of	—	22	20	15	12
Metal lath plastered with VG or perlite-gypsum plaster of thickness of	32	12	12	12	12

*Light-mesh reinforcement required—12 millimetres to 20 millimetres below the surface unless special corner-beads are used.
†Screwed to battens consisting of asbestos insulation board of not less than 25 millimetres in thickness.

TABLE VII

REINFORCED-CONCRETE COLUMNS

A. REINFORCED-CONCRETE COLUMNS: FIRE-RESISTANCE RATINGS AND DIMENSIONS

1	2	3	4	5	6
Condition, construction and materials	Minimum dimension of column, in millimetres, excluding any plaster, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
1. Rectangular column, other than a column described at item (2) below—					
(a) Class 2 aggregate—					
Unplastered	450	300	250	200	150
Plastered with VG	300	230	200	150	125
Unplastered, but reinforced, in addition to main reinforcement, with hard-drawn steel-wire fabric of maximum pitch of 150 millimetres in either direction, placed in concrete cover to main reinforcement	300	230	200	200	150
(b) Class 1 aggregate—					
Unplastered	300	230	200	200	150
2. Rectangular column built into a wall having a fire resistance of not less than that of the column, no part of the column projecting beyond either face of the wall; any aggregate—					
Unplastered	180	100	100	75	75
Plastered with VG	150	100	75	75	75

TABLE VII (*continued*)

B. REINFORCED-CONCRETE COLUMNS: MINIMUM COVER TO REINFORCEMENT

1	2	3	4	5	6
Type of aggregate	Minimum cover to main reinforcement, in millimetres, including plaster, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
Class 2 aggregate	65 *50	50 *40	40	40	40
Class 1 aggregate†	40	40	40	40	40

*Reinforcing steel protected with wire mesh or steel ties.
†For CS plaster, only 75 *per centum* of the actual thickness to be regarded as contributing to the cover.

TABLE VIII

REINFORCED-CONCRETE BEAMS: FIRE-RESISTANCE RATING

1	2	3	4	5	6
Construction and materials	Minimum thickness of concrete cover to main reinforcement, in millimetres, excluding any plaster, for fire-resistance rating of—				
	4 hours	2 hours	1½ hours	1 hour	½ hour
Unplastered	65	50	40	25	12
Plastered with CS or GS on metal lath fixed around beam	50	40	25	12	12
Plastered with VG on metal lath fixed around beam	25	12	12	12	12

TABLE IX

FIRE-DOORS AND FIRE-SHUTTERS: FIRE-RESISTANCE RATING

Description of fire-door or fire-shutter	Presumed fire-resistance
(a) Iron or steel door or shutter or metal-covered door or dreadnought door constructed and fixed in accordance with specification numbers 1, 2 or 5 of the rules published by the Fire Officers' Committee for the Construction and Fixing of Fireproof Doors, Compartments and Shutters, section 1	2 hours
(b) Fire-check flush-door complying with the provisions of British Standard Number 459: Part 3: 1951, fitted in the frame complying with the said British Standard—	
finished thickness of door 54 millimetres	1 hour
finished thickness of door 44 millimetres	½ hour*
(c) Hardwood doors in which the stiles and rails are timber members of not less than 44 millimetres in thickness and not less than 76 millimetres in width, and in which the panels are made up of timber boards of not less than 22 millimetres in thickness and not less than 76 millimetres in width, to a total thickness of not less than 44 millimetres, and in which the stiles, rails and boards forming the panels are solidly fixed together by means of proper joints, and, where necessary, by screws, but being in no way dependent on glue for its structural integrity, and which is fitted in a solid-hardwood timber frame, the frame being constructed in accordance with the provisions of British Standard Number 459: Part 3: 1951	½ hour*

* If there are any openings, such openings shall be glazed with fire-resisting glazing in accordance with the specifications set out in paragraphs 3 to 6 hereunder.

SPECIFICATIONS FOR FIRE-RESISTING GLAZING

3. Fire-resisting glazing shall be carried out in wire-woven glass or approved lock-bar copper glazing, either of which shall be not less than 6 millimetres in thickness.

4. (1) Wire-woven glass shall contain embedded wire netting of a mesh not larger than 25 millimetres, and shall be in separate panes not exceeding 0,25 square metre in area each.

(2) Lock-bar copper glazing shall be formed into separate rectangular panes not exceeding 0,4 square metre in area.

(3) Each pane shall be formed of separate rectangular sub-panes, not exceeding 0,01 square metre in area each, set in copper sub-frames mechanically locked together.

5. (1) The panes referred to in paragraph 4 shall be set in non-opening frames or sashes of steel or hardwood.

(2) Hardwood frames or sashes shall be not less than 44 millimetres in finished thickness.

(3) The frames shall be set in rebates or grooves of not less than 6 millimetres in width or depth, with adequate allowances for expansion, and shall be secured by hard-metal fastenings to the frames or sashes independently of any lead, cement or putty used for weatherproofing purposes or of any wooden glazing-beds.

6. Except in the case of a glazed opening in a fire-door, the frames or sashes referred to in paragraph 5 shall be solidly built into masonry or concrete construction on all sides of the opening.

THIRD SCHEDULE (*Sections 7 and 8*)

SURFACE SPREAD OF FLAME TEST

This test is for determining the tendency of materials to spread flame across their surfaces. It is intended to be applied to materials used as internal linings on walls and ceilings, and enables their classification to be determined according to the rate and distance of flame spread over their surfaces.

The performance in the test applies to the thickness of the specimen subjected to the test, and may not be valid for other thicknesses unless verified by a test.

SIZE AND NUMBER OF SPECIMENS

1. A test sample of a material shall comprise six representative specimens, each 230 × 900 millimetres, and of their normal thickness where this does not exceed 50 millimetres. Materials of thicknesses exceeding 50 millimetres shall be reduced to 50 millimetres, and the original surface shall be tested.

PREPARATION AND CONDITIONING OF SPECIMENS

2. Before test, the edges, together with a strip 40 millimetres wide from the edges on the unexposed face, shall be painted with a sodium-silicate composition, the ingredients of which are specified in paragraph 6, after which the specimens shall be conditioned to a moisture content in equilibrium with air at 10–21 degrees Celsius and 55–65 *per centum* relative humidity.

METHOD OF TEST

3. (1) The specimen shall be securely fixed to a wooden framework faced with asbestos millboard, being secured in such a way that the face of the specimen may burn without obstruction from the supports. It shall be mounted with its long axis horizontal and its face vertical, and shall be brought, in not longer than five seconds, from a position at room temperature to its test position virtually at right-angles to the furnace. An adjustment of a few degrees is allowable, in order to achieve the specified pattern of incident radiation, since this is the primary requirement.

(2) The intensity of the radiated heat incident on the specimen shall vary with distance from the hotter end, so that when the calibrating panel specified in paragraph 7 is mounted in the place to be occupied by the specimen the electromotive-force output of the radiometers shall be as given in the Table below, within ± 1 mV, with reference to a cold-junction temperature for the radiometers of 0 degrees Celsius.

Note.—The instruments used to measure electromotive force should be of laboratory standard, and calibrated and capable of making the measurements with the necessary accuracy.

(3) Immediately the specimen is exposed to the radiated heat, a vertical luminous gas flame shall be applied to its hotter end for one minute. This flame shall be 75 to 100 millimetres in length and shall issue from a 9-millimetres-diameter orifice placed not more than 6 millimetres in front of the surface of the specimen and at 6 millimetres above its lower edge.

(4) The room in which the test is made shall be substantially free from draughts.

TABLE

OUTPUT OF RADIOMETERS

Distance from hotter end of specimen	mm	75	150	225	300	375	450	525	600	675	750	825
Electromotive force	mV	31,5	28,5	26,0	23,5	21,5	19,5	18,0	16,5	15,0	13,5	12,0
Temperature	°C	435	395	365	335	305	280	260	240	220	200	180
Radiation intensity	W/cm²	3,70	3,10	2,55	2,10	1,84	1,51	1,34	1,17	1,05	0,88	0,75

OBSERVATIONS DURING TESTING

4. As soon as the igniting flame is in contact with the specimen, observations shall be made of the time of spread of the flame front for measured distances along a line drawn parallel to the long axis, 75 millimetres from the bottom edge of the specimen. Measurements shall be continued until the flames have died out or for 10 minutes, whichever is the longer time.

CLASSIFICATION OF SURFACE SPREAD OF FLAME

5. Surfaces shall be classified under one of the following headings, according to their observed behaviour under test. For a full evaluation of a material having faces which differ, each face shall be classified separately.

Four classes are specified 1, 2, 3 and 4 (see Figure 1). All specimens in a sample shall have flame-

FIGURE 1

CLASSIFICATION LIMITS FOR SPREAD OF FLAME TEST

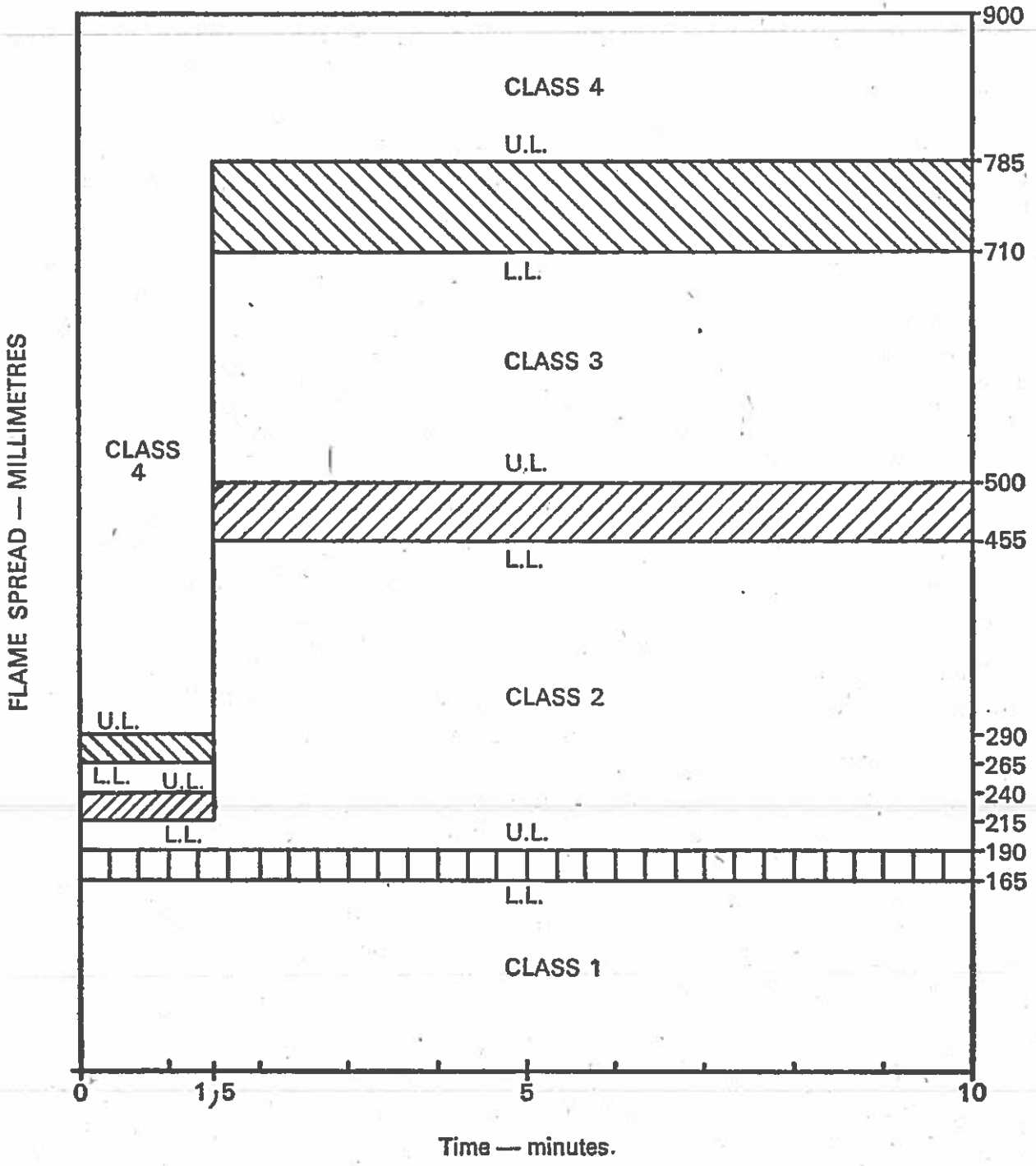
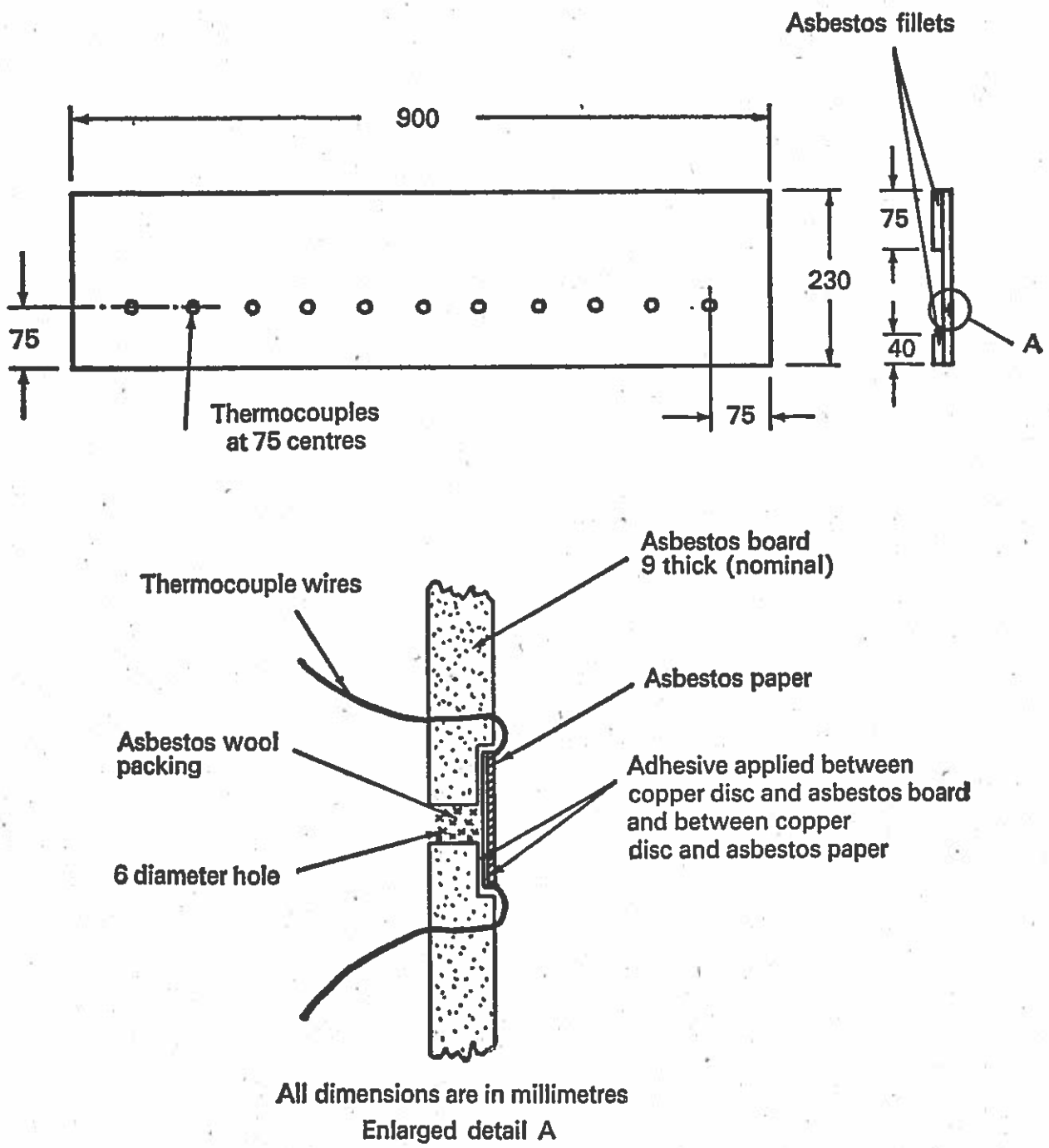


FIGURE 2

DETAIL OF PANEL FOR CALIBRATION OF RADIATION FURNACE



spread distances not exceeding the lower limit assigned below, with the proviso that, for one specimen only in the sample, the flame spread may exceed this limit, as long as it does not pass the upper limit of the class—

Class 1.—A surface on which the lower limit for final distance of spread of flame is 165 millimetres and the upper limit is 190 millimetres.

Class 2.—A surface on which the lower limit for spread of flame after one and a half minutes is 215 millimetres and the upper limit is 240 millimetres. The corresponding limits for final distance are 455 millimetres and 500 millimetres, respectively.

Class 3.—A surface on which the lower limit for spread of flame after one and a half minutes is 265 millimetres and the upper limit is 290 millimetres. The corresponding limits for final distance are 710 millimetres and 785 millimetres, respectively.

Class 4.—Exceeding class 3 limits.

INGREDIENTS OF SODIUM SILICATE COMPOSITION

6. (1) The silicate composition shall conform to the following proportions by mass—

kaolin, 1,50;
sodium silicate, 1,12;
water, 1,00.

(2) The sodium silicate shall be of a "neutral" grade in the form of an aqueous syrup, in which the ratio of soda to silica is between Na_2O: 3,2 SiO_2 and Na_2O: 3,4 SiO_2 and that has a density of between 1,41 and 1,43.

(3) This flame-retardant composition is not suitable for use as a permanent paint for fire-protection purposes.

CALIBRATION OF APPARATUS AND SPECIFICATION FOR PANEL AND RADIOMETERS

7. The panel to support the radiometers for measuring the intensity of radiant heat falling on a specimen, is shown in Figure 2. It consists of a base-board of 9 millimetres in thickness of asbestos wood having a density of 1 320 to 1 450 kilograms per cubic metre. Recesses at 75-millimetres intervals and drawn parallel to a longer edge of the board, and 75 millimetres from it, as shown in Figure 2, and 0,3 millimetre in depth, are made for 25-millimetres-diameter copper discs. The discs have a thickness of 0,002 millimetre, and are fitted with a thermocouple of 0,71-millimetre-diameter chormel/constantan wire silver-soldered, to the exposed face. An asbestos-paper disc of 25 millimetres in diameter and 0,25 millimetre in thickness is fixed to the copper disc over the thermocouple with sodium silicate. The copper discs are secured in the recesses in the base-board with sodium silicate.

FOURTH SCHEDULE (*Section 1*)

COMBUSTIBILITY TEST FOR BUILDING MATERIALS

This test is to determine whether a building material is non-combustible or combustible within the meaning of the definition, as given in paragraph 6.

FIELD OF APPLICATION

1. The test is intended for building materials whether coated or not, but it is not intended to apply to the coating alone.

SAMPLING

2. The sample should be sufficiently large to be representative of the material, particularly in the case of non-homogeneous materials.

APPARATUS

3. (1) *Furnace.*—The furnace consists principally of a tube of refractory material having a density between 1 500 and 2 000 kilograms per cubic metre with an inner diameter of 75 millimetres, a height of 150 millimetres, and an over-all wall thickness of 10 to 13 millimetres. The tube is provided with one or more electrical heating coils and is located within an insulated surround, as shown in Figure 1. To the lower end of the furnace is attached a cone-shaped air-flow stabilizer, 500 millimetres in length and reducing from a 75-millimetres internal diameter at the top to a 9-millimetres internal diameter at the lower end. The stabilizer can be made of steel sheet of approximately 1 millimetre in thickness, and should be finished smooth on the inside, particular attention being given to the smoothness and the tightness of the joint with the furnace. At the open top of the furnace, a draught-shield, which may be made of the same material as the stabilizer cone, should be provided, having an internal diameter of 75 millimetres and a height of 50 millimetres.

(2) *Furnace stand.*—The furnace is mounted on a stand with a clearance of approximately 250 millimetres between the floor and the lower end of the air-flow stabilizer. This clearance must be protected against disturbance by air currents. An adequate protection can be provided by using shields around the stand to a height of approximately 550 millimetres from the floor.

(3) *Furnace control.*—The electric winding of the furnace should be so arranged that a vertical zone of at least 60 millimetres in length exists at mid-height of the empty furnace with uniform temperature conditions, within a tolerance of ± 5 degrees Celsius, as measured by a thermocouple located 10 millimetres from the wall. This may be achieved by either having closer windings at the two ends of the furnace tube or by means of separate windings at the ends controlled independently of the central section. To minimize temperature fluctuations in the furnace, it is necessary to use a voltage stabilizer in the circuit, able to maintain voltage within $\pm 0,5$ *per centum* of the nominal value.

(4) *Temperature measurements.*—Temperatures should be measured by means of sheathed thermocouple wires having a combined outside diameter of 1 millimetre with thermo-electric wires of approximately 0,2 millimetre in diameter. The sheath protection provided on the hot junction should have an outside diameter of 1,5 millimetres and a length of 10 millimetres, as in Figure 2. The temperature should be measured with a recorder having a measuring-range which corresponds with the temperature changes which occur during the tests. Measurement should be made at intervals of not greater than 10 seconds. The temperature-measuring equipment should have an accuracy of at least 0,5 *per centum*.

(5) *Location of thermocouples.*—Two thermocouples should be used, the furnace thermocouple to measure the furnace temperature and the specimen thermocouple to measure the temperature in the centre of the specimen. The furnace thermocouple should be located with its hot junction 10 millimetres from the wall of the furnace and at mid-height of the constant temperature zone, by means of small steel spacers, with 2,5-millimetres-diameter holes, attached to the top and bottom edges of the draught-shield.

The specimen thermocouple should be located with its hot junction in the centre of the specimen, and should be inserted from the top through a hole of 2 millimetres in diameter. As the hole remains open, it is necessary to ensure that the thermocouple maintains contact with the material at its bottom.

(6) *Specimen holder and insertion device.*—The specimen is placed in a holder made of nichrome or heat-resisting steel. At the bottom of the holder, a fine metal gauze of heat-resisting steel should be provided, as shown in Figure 3. The mass of the holder assembly should not exceed 20 grams. The holder is suspended from the lower end of an adjustable tube of heat-resisting steel having an outside diameter of approximately 6 millimetres and a bore of 2 millimetres. The specimen insertion device consists essentially of a metallic sliding rod moving freely in a vertical tube fitted to the side of the furnace. The heat-resisting steel tube with the specimen holder is fixed by a space bar to the sliding rod. The design of the insertion device should be such that the specimen is introduced into the furnace rapidly and without any shock. The inserted specimen should occupy a specified position in the furnace in the middle of the constant-temperature zone, and equidistant from the walls.

TEST SPECIMENS

4. (1) *Preparation of specimens.*—The specimens should be as representative as possible of the average properties of the sample, and should be prepared to the size defined in subparagraph (5).

(2) If the thickness of the material is less than 50 millimetres, the specimen must be made of sufficient layers, to achieve the thickness required in subparagraph (5). The layers should occupy a horizontal position, and should be held together firmly by means of fine wire to prevent air gaps between layers. The density of the specimen should be representative of the density of the material.

(3) For composite materials of a thickness, such that a number of layers cannot be put together to give a specimen of the specified size as described above, the specimen should be prepared to the required thickness by adjusting the thickness of the different components.

(4) If it is not possible to follow this procedure to prepare the specimen, tests should be performed on the individual components and reported accordingly.

(5) *Number and size.*—For test purposes, three specimens should be prepared, as described in subparagraph (1). The nominal dimensions and tolerances for the specimen sizes are as given below—

width and breadth, 40 mm + 0–2 mm;
height (thickness), 50 mm ± 3 mm;
volume, 80 cm^3 ± 5 cm^3.

(6) *Conditioning.*—The specimens should be conditioned in a ventilated oven maintained at 60 degrees Celsius ± 5 degrees Celsius for at least 20 hours, and cooled to ambient temperature in a dessicator prior to the tests.

PROCEDURE

5. (1) *Apparatus.*—Before starting the test, it is necessary to ascertain that the whole equipment is in good working order, for example, the stabilizer is clean, the insertion device is working smoothly and the specimen holder occupies the exact position in the furnace. The equipment should be protected against draughts and not be exposed to direct sunlight or artificial illumination.

(2) The furnace should be heated and the furnace temperature stabilized at 750 degrees Celsius ± 10 degrees Celsius for a minimum period of 10 minutes before the insertion of a specimen.

(3) *Insertion of specimen.*—The specimen should be placed in the holder described in subparagraph (6) of paragraph 3 and inserted in the furnace, not more than five seconds being taken for this operation.

(4) *Duration of heating.*—The heating period commences with the insertion of the specimen in the furnace, and should be continued for a period of 20 minutes.

(5) *Test observations.*—A record should be made of the temperature readings from the two thermocouples during the heating period, and note taken of the occurrence and duration of any flaming.

(6) *Number of specimens tested.*—The test is carried out on three specimens, prepared as specified in subparagraphs (1) and (5) of paragraph 4. The tests should be limited to less than three, if the material has already shown itself to be combustible, as defined in subparagraph (2) of paragraph 6.

EXPRESSION OF RESULTS

6. (1) *Non-combustibility.*—A material shall be deemed non-combustible if, during the test, not one of the three specimens—

(a) causes the temperature readings of the furnace thermocouple to rise by 50 degrees Celsius or more above the initial furnace temperature;

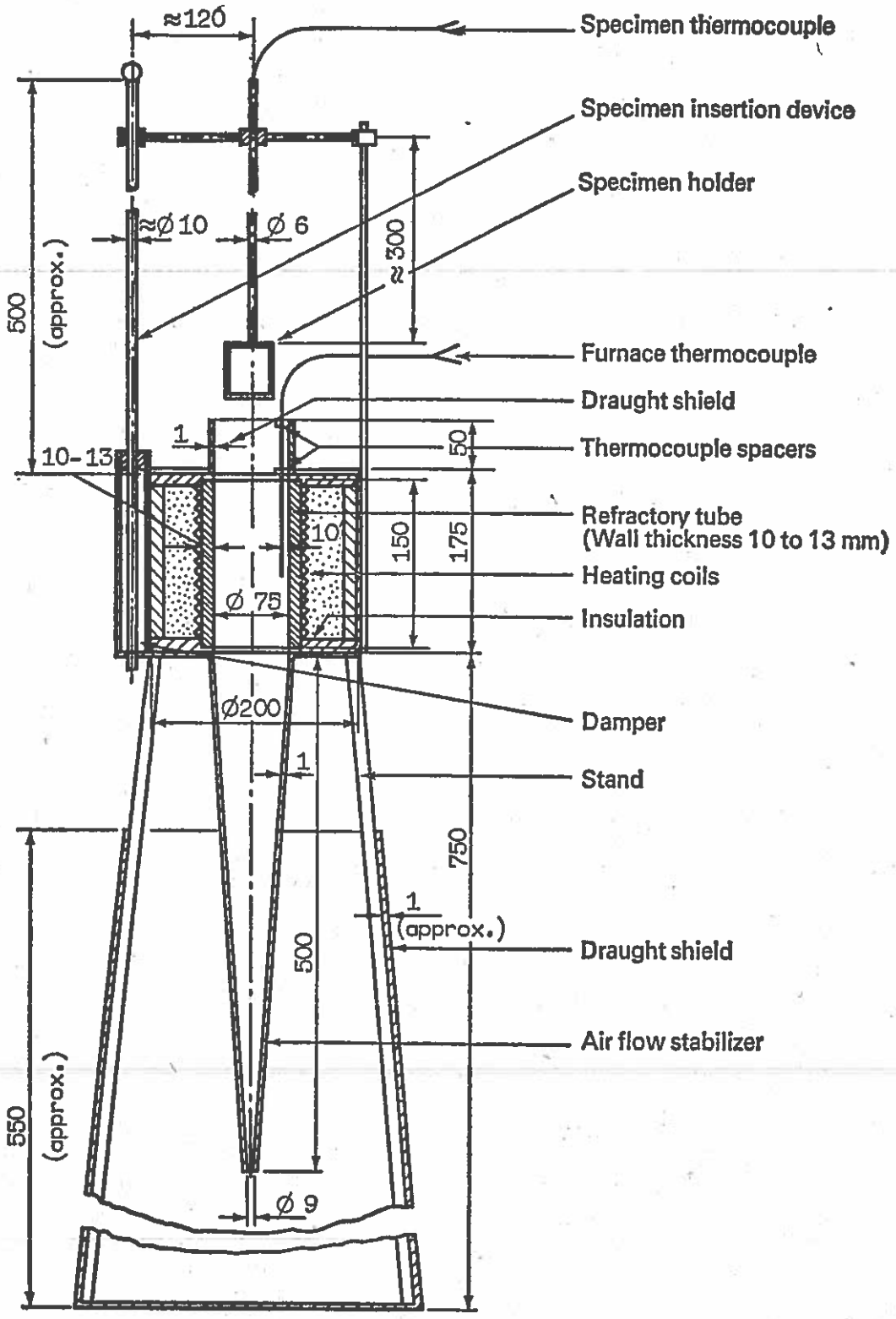
(b) causes the temperature readings of the specimen thermocouple to rise 50 degrees Celsius or more above the initial furnace temperature;

(c) flames for 10 seconds or more. Flamings for durations of less than 10 seconds shall be ignored.

(2) *Combustibility.*—If one of the three criteria is not satisfied for any of the three specimens, the material shall be deemed combustible.

FIGURE 1

GENERAL ARRANGEMENT: NON-COMBUSTIBILITY APPARATUS



(All dimensions are in millimetres)

FIGURE 2

FURNACE THERMOCOUPLE AND SPECIMEN THERMOCOUPLE

FIGURE 2a

FURNACE THERMOCOUPLE

FIGURE 2b

SPECIMEN THERMOCOUPLE
(for section of thermocouple, see Figure 2a)

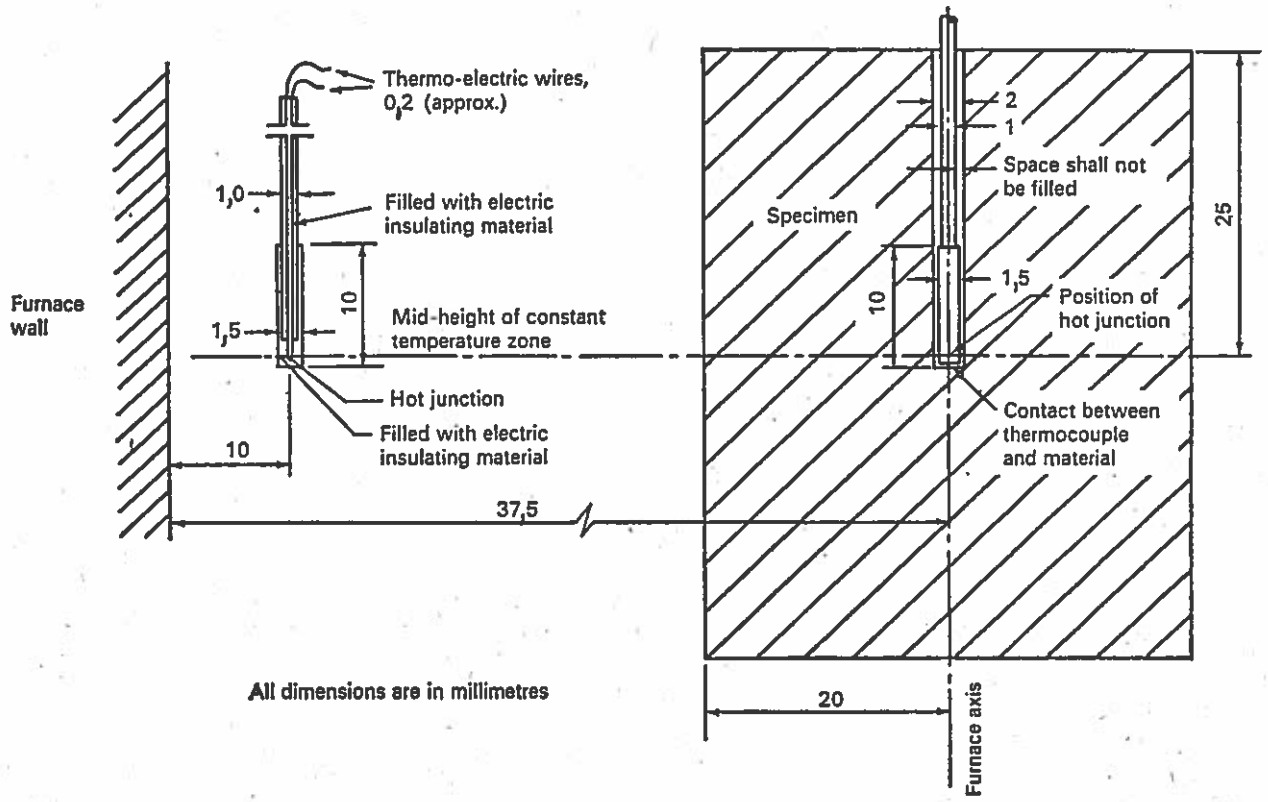
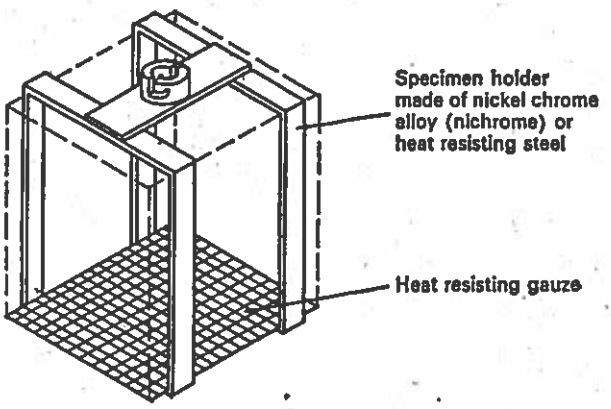


FIGURE 3

EXAMPLE OF A SPECIMEN HOLDER



CHAPTER 12

PUBLIC SAFETY

ARRANGEMENT OF SECTIONS

PRELIMINARY

INTERPRETATION OF TERMS

1. In this Chapter—

"builder" means any person who undertakes or carries out building work, whether as owner or as contractor for such owner, and includes an excavator who is not a contractor;

"building-line" means a line established on private property to define the limits of the area on which buildings may be erected;

"building work" means any work, including excavation work in connexion with the erection, alteration, renovation, repair or demolition of a building;

"chimney", without limiting the ordinary meaning of the word, includes a smoke-stack;

"covered walkway" means a walkway provided with a roof or deck to preserve the safety of the public using any street or public place;

"encroaching projection" means a projection which encroaches into, or over, any street or public place;

"excavation work" includes loosening, taking out and removing stone or soil or other material in connexion with building work;

"excavator" means any person who undertakes excavation work;

"height of chimney" means the height of a chimney above the point at which it is connected to a building or another structure on which it is supported, or, if it is not supported, the height above its foundation on or below the ground;

"walkway" means a boarded or built-up footway provided to enable pedestrians to pass the site of building work without having to walk in that part of the street used by vehicular traffic.

PART I

HIGH CHIMNEYS, SPIRES, MASTS AND SIMILAR STRUCTURES

HIGH CHIMNEYS, TOWERS, STEEPLES, ET CETERA

2. Every person who proposes to construct a chimney which has a height greater than six times its least lateral dimension at its base, or any tower, spire, steeple or similar structure shall submit the calculations of the stresses and details of its design to the local authority, or a certificate by a structural engineer in terms of paragraph (e) of subsection (1) of section 6 of Chapter 2, and may not commence erection until written approval has been obtained.

MASTS, AERIAL POLES AND FLAGPOLES: MATERIALS

3. (1) Masts, aerial poles and flagpoles which, in the opinion of the local authority, might endanger the

safety of the public, by reason of their size, position or nature of construction, shall be constructed—

(a) of steel, timber or other such material as the local authority may, in writing, permit; and

(b) if of timber, so as to comply with the provisions of subsections (2) and (3).

(2) Timber whether local or imported shall be sound, of good quality and if of soft wood shall comply with the requirements of merchantable grade C.A.S. 03, Structural timber.

(3) Timber poles shall be pressure-treated with an approved preservative after all cutting and holing has been completed, and shall have their top ends fitted with a protective cap of timber or other approved material.

MASTS, ET CETERA: STRESSES AND DIMENSIONS

4. (1) When stresses and dimensions of timber poles are calculated, the extreme fibre-stress under maximum design forces shall not exceed 27 *per centum* of the average modulus of rupture for the species concerned, determined on clear specimens of maturity equivalent to that of the timber being used.

(2) The stresses and dimensions in regard to steel poles shall be calculated in accordance with the requirements of the provisions of Chapter 3.

(3) Unstayed aerial poles and flagpoles of dimensions other than those set out in this section, and all built-up masts, shall be permitted only after the necessary calculations and drawings have been submitted to the local authority and the construction has been approved by it.

(4) Unstayed flagpoles and aerial poles having an inclination not exceeding one horizontal to four vertical shall be permitted, provided that they comply with the requirements set out in Table I or Table II, and, if such poles are permitted by the local authority to project over a street or public place, they shall, in addition, comply with paragraphs (c) and (d) of section 8.

(5) If the minimum diameter of a natural timber pole—

(a) does not exceed 125 millimetres, the diameter of such pole shall be 20 millimetres greater than as specified in Table II;

(b) exceeds 125 millimetres, the diameter of such pole shall be 25 millimetres greater than as specified in Table II.

MASTS, ET CETERA: MISCELLANEOUS

5. (1) Masts, flagpoles and aerial poles shall be rigidly secured at their base, so as to resist all forces which may be imposed on them at the stresses permitted by these by-laws.

(2) Subject to the provisions of any other law relating thereto, masts and poles for radio and television aerials having dimensions other than those set out in Table I or Table II shall comply with the following requirements—

(a) each mast and pole shall be stayed against the pull of the aerial wire in at least two directions;

(b) each stay shall form a horizontal angle of not less than 30 degrees with the extended line of the aerial wire, and a vertical angle of not less than 30 degrees with the mast or pole.[1]

(3) After masts, flagpoles and aerial poles have been inspected by the local authority to ascertain that there are no defects, they and all their fittings shall be painted or otherwise treated, where necessary, to preserve them from weathering, and such preservative treatment shall be maintained at all times, to the satisfaction of the local authority.

(4) All such masts and poles exceeding 4 metres in length shall be so designed as to permit them to be lowered for maintenance purposes, unless the local authority permits otherwise.

[1] The permission of the Posts and Telecommunications Corporation, or the suppliers of electric current, should be obtained where aerials or stays pass near telephone-lines or power-lines.

TABLE I

PERMISSIBLE DIMENSIONS OF UNSTAYED MILD-STEEL FLAGPOLES AND AERIAL POLES WHICH ARE PERMITTED TO BE ERECTED IN TERMS OF SUBSECTION (4) OF SECTION 4

(all poles to be of seamless or welded steel tubes (heavy series) with plain ends and inserted joints)

1	2	3	4	5
Position and length of pole		Dimensions at cross-section considered		
Maximum height of top above ground, in metres	Maximum length permitted, in metres	Maximum distance below top, in metres	Minimum nominal bore, in millimetres	Minimum thickness, in millimetres
12	12 for vertical flagpoles	1,8 3,1 4,9 6,4 8,5	25 32 50 65 80	4,05 4,05 4,5 4,5 4,85
	6 for aerial poles and inclined flagpoles	9,5 11,3 12,0	90 100 125	4,85 5,4 5,4
Exceeding 12, but not exceeding 42	9 for vertical flagpoles	1,5 2,7 4,0 5,5	25 32 50 65	4,05 4,05 4,5 4,5
	6 for aerial poles and inclined flagpoles	6,4 7,3 9,1	80 90 100	4,85 4,85 5,4

TABLE II

PERMISSIBLE DIMENSIONS OF UNSTAYED TURNED TIMBER POLES WHICH ARE PERMITTED TO BE ERECTED IN TERMS OF SUBSECTION (4) OF SECTION 4

(minimum thickness or diameter at top of pole = 75 millimetres)

1	2	3	4
Position and length of pole		Dimensions at cross-section considered	
Maximum height of top above ground, in metres	Maximum length permitted, in metres	Maximum distance below top of pole, in metres	Minimum diameter (or thickness), in millimetres
12	11 for vertical flagpoles	2,1 4,0 4,9	75 90 100
	7 for aerial poles and inclined flagpoles	6,1 7,6 8,8 9,8 11,0	115 125 140 150 165
Exceeding 12, but not exceeding 42	7 for vertical flagpoles	2,1 3,4 4,3	75 90 100
	6 for aerial poles and inclined flagpoles	4,9 5,8 6,4 7,6	115 125 140 150

PART II

ENCROACHING PROJECTIONS

PROJECTIONS TO BE REMOVABLE WITHOUT DANGER

6. Every encroaching projection which is permitted by the local authority shall be so constructed that its presence is not essential to the structural stability of the building to which it is attached:

Provided that this section shall not apply to foundations permitted by the local authority to encroach.

BUILDINGS AT CORNERS OF STREETS

7. At street corners where the building-line is splayed, buildings shall not project beyond such splay, unless permitted by the local authority, and then not farther than the continuation of the unsplayed building-lines and not nearer than 450 millimetres to a vertical line through the edge of the kerb:

Provided that, in such a case, a clear height of not less than 3,25 metres is maintained under the projecting portion.

CONSTRUCTIONAL REQUIREMENTS FOR ENCROACHING PROJECTIONS

8. Encroaching projections, including, amongst others, veranda roofs, balconies, landings, stairways, flagpoles and gantries for cranes, the erection of which is permitted by the local authority, shall—

(a) not be supported by encroaching columns;

(b) be constructed of non-combustible material or be provided with protection having a fire-resistance rating, determined according to the provisions of Chapter 11, of not less than half an hour;

(c) subject to the provisions of section 7, be not less than 3 metres above the level of the footway measured to the underside of the lowest portion;

(d) be at every point at least 300 millimetres back from the vertical line through the edge of the kerb;

(e) provide for disposal of rain-water, in accordance with section 9.

RAIN-WATER NOT TO DISCHARGE OVER FOOTWAY OR SIDEWALK

9. All buildings, the roofs of which are liable to discharge rain-water over any footway or sidewalk, shall have gutters and drain-pipes installed and maintained by the owner of the building in such a manner and to such an extent as may be necessary to prevent any discharge of rain-water over any footway or sidewalk.

STORM-WATER DISCHARGED FROM PREMISES

10. (1) Where required to do so in writing by the local authority the owner of any premises which discharges stormwater on to a street shall either—

(a) construct channels or conduits or lay pipes to conduct such water to channels or conduits vested in the local authority, so as to prevent any discharge of storm-water over a footway or sidewalk; or

(b) meet the charges of the local authority for carrying out the work required under paragraph (a).

(2) The owner of any premises served by the said channels or conduits shall thereafter maintain these in good working order.

PARAPETS AND BALUSTRADES

11. (1) The edge of all steps, landings, balconies, bridges, flat roofs and other places from which there is danger of a person falling shall be provided with parapet-walls, guard-railings or balustrades, unless access by persons to such places has been excluded by an adequate physical barrier satisfactory to the local authority.

(2) Such parapets, railings or balustrades shall have a height of not less than 850 millimetres, measured from the floor or from the centre of a tread vertically to the top of the parapet, railing or balustrade.

(3) Balustrades or railings to internal stairs shall have the same minimum height, and, in addition, the balusters, rails or other parts shall not have openings in or between them which permit the passage of a 125-millimetre-diameter ball.[2]

RAMPS

12. (1) Where ramps are used in buildings for the transfer of motor vehicles from one floor to another, those which meet the ground-level shall do so at a distance of not less than 6 metres from any exit from the building to a street or courtyard. The gradient of such ramps shall not exceed one vertical in four horizontal.

(2) Ramps used in temporary construction, such as a walkway past the site of building work, shall have gradients not exceeding one vertical in six horizontal.

(3) Where a ramp is intended to be used by both vehicles and pedestrians, it shall—

(a) have a width between enclosing-walls of not less than 3,35 metres; and

(b) have a raised walkway of not less than 150 millimetres in height and of not less than 900 millimetres in width on at least one side of that portion of the ramp which is to be used by vehicles.

WINDOWS OPENING OVER PAVEMENTS

13. No window, shutter or similar attachment shall open over a pavement, sidewalk, square or other public place so as to have less than 2,5 metres clear below the bottom of such attachment when open.

SUN-BLINDS PROJECTING OVER STREETS

14. (1) A sun-blind may be erected and maintained provided that—

(a) if it is of the canopy-type, no part of such sun-blind is erected—

(i) at a height of less than 2,5 metres above the level of the sidewalk;

(ii) so as to project more than 2,5 metres from the face of the building to which it is affixed;

(b) if it is not of the canopy-type, no part of such sun-blind is erected in such manner that it shall be capable of being extended lower than—

(i) 1,7 metres above the level of the sidewalk, if any portion of such sun-blind which is nearest to an intersection is 3 metres or more from such intersection:

Provided that the lower 0,5 metre of such sun-blind shall comprise flaps divided into sections not exceeding 2 metres in length;

(ii) 2,2 metres above the level of the sidewalk, if any portion of such sun-blind is situated nearer than 3 metres from an intersection.

(2) At or before sunset each day, every sun-blind shall be folded or otherwise raised in such manner that no part of such sun-blind is situated nearer to the level of the sidewalk than 2,2 metres.

(3) For the purposes of this section, "sun-blind" means an awning or a blind which projects from a building over a street or which hangs under a veranda over a street.

PROJECTING LAMPS

15. Every lamp which projects from a building, or which hangs under a veranda over a street, shall be affixed and maintained at a height of not less than 2,5 metres above ground-level.

PART III

PRECAUTIONS DURING BUILDING WORK

BUILDING WORK WHICH AFFECTS OR WHICH MAY AFFECT ANY STREET OR PUBLIC PLACE: GENERAL AND SPECIFIC REQUIREMENTS

16. (1) A builder or plumber who intends to undertake any building or sewerage work in, over or under any street or public place, or any portion thereof vested in or under the control of the local authority, or which is so situated that its performance is calculated, on reasonable grounds, to endanger the safety of, or to cause inconvenience to, the public using such street or public place, shall, before commencing to do such work, obtain the specific written permission of the local authority therefor, and shall, if such permission is granted, in respect of, and during the performance of, such work, comply with—

(a) the Factories and Works Act [*Chapter 283*], any Act replacing that Act and any regulations made in terms of any such Act; and

(b) any conditions which the local authority may have imposed upon the granting of its permission and which may be reasonably necessary to ensure the safety and convenience of the public; and

(c) the requirements of this Part.

(2) The local authority may, by order, in writing, served on the builder or plumber concerned, withdraw any permission granted in terms of subsection (1), if the work in respect of which the permission was granted, or any part thereof, or the manner of its

[2] Requirements for treads and risers and other requirements for balustrades and hand-rails to stairs are set out in Chapter 11, which also requires guards for exterior stairways.

performance, endangers or is calculated, on reasonable grounds, to endanger the safety of the public.

(3) In the order referred to in subsection (2), the local authority may require the builder or plumber to stop such work, or portion thereof, or the manner of its performance, or to remove such work or any portion thereof, until the danger has been eliminated, to the satisfaction of the local authority.

TEMPORARY WALKWAYS

17. (1) Where a portion of a street or public place is to be used for, or in connexion with, building work and the space on the sidewalk available to the public will, in consequence, be less than 1,5 metres in width, or if there will in any case be, in the opinion of the local authority, no safe passage for the public, a walkway of not less than 1,25 metres in width, or of such greater width as the local authority may require, shall be constructed for use during the period during which such portion of such street or public place is used for such building work.

(2) Protective railings shall be provided for such walkways.

(3) Ramps or stairways with protective railings shall also be provided for such walkways, where such provision is necessary for the safety or convenience of the public.

WARNING SIGNS AND WARNING LIGHTS

18. The portion of any such street or public place, as is referred to in section 17, and any openings or obstructions which might be a source of danger to the public shall be indicated by red lights, which shall be kept alight from sunset until sunrise, placed so as to be clearly visible from all directions, at intervals not exceeding 6 metres, and of sufficient intensity to give adequate warning to traffic both vehicular and pedestrian.

WATCHMAN: WHEN REQUIRED

19. If the public are prevented, by reason of anything done or being done in connexion with building work, from seeing vehicles about to emerge from the site of such work into a street or public place, a watchman shall be employed, to warn the public of the impending emergence of such vehicles at each point of emergence.

STORAGE OF MATERIALS

20. Materials or equipment kept or stored on covered walkways, scaffolds or similar working-platforms shall not impose a load on any part thereof which exceeds its safe carrying capacity, and, where these are kept or stored within a building, they shall not cause overloading within the meaning of Chapters 2 and 3.

PRECAUTIONS DURING DEMOLITION OPERATIONS

21. (1) Where building work involves the demolition of a building, the site of such work shall be enclosed by means of railings, hoardings, cladded scaffolding or covered walkways (hereinafter referred to as "protective structures") along every boundary between such site and any street or public place:

Provided that, if the building to be demolished is more than 7,5 metres high or is less than half the height of the building distant from such boundary, a hoarding or a covered walkway shall be erected.

(2) Covered walkways shall be erected and retained in position, in accordance with the provisions of section 22.

(3) All gas, electricity, water and other supply-lines, and all sewers and drains, shall be re-laid or shut off and capped before demolition is commenced.

(4) All glass in windows, doors, roof-lights or other places shall be removed from any part of a building before demolishing of that part commences.

(5) Before any structural member of a lower storey is disturbed, the storey above it shall be completely removed.

(6) Structural-steel frames shall be demolished column length by column length in sound structural sequence and floor by floor.

(7) No mechanical method of demolition whereby wrecking is accomplished by smashing with a heavy weight suspended from a boom or hoist, or by the use of a power-shovel, bulldozer, winch or other mechanical contrivance, shall be employed, unless the building, or the remaining portion thereof, to be demolished does not exceed 6 metres in height, and unless a clear zone is maintained during demolition operations, of a width equal to one and a half times the height of such building, or portion thereof, if it is to fall outwards, or 3 metres, if it is to fall inwards, between it and a temporary hoarding, which shall be erected around such building or portion thereof.

(8) No person not engaged on such demolition operations shall be permitted to be in such clear zone.

(9) Demolition operations which, in the opinion of the local authority, are likely to endanger the safety of the public shall take place only at times fixed in advance by the local authority, with a view to eliminating, or reducing to a minimum, the likelihood of such danger.

COVERED WALKWAYS

22. (1) Where building work involving the erection or demolition of a building is done within 3 metres from the boundary of any street or public place, covered walkways shall be erected along the entire boundary of such street or public place affected by such work, unless written exemption is obtained from the local authority.

(2) In the case of the erection of a building, a covered walkway shall be kept in position for as long as work is performed on the exterior of such building.

(3) A covered walkway shall be kept in position, until the building has been demolished to a height below that of the covering of such walkway, and other protective structures shall be kept in position, until the demolition operations have, in the opinion of the local authority, been completed.

(4) Covered walkways used in connexion with building work shall be erected in accordance with the following requirements and designed to the satisfaction of the local authority—

(a) the decks shall safely sustain a superimposed load of 75 kilograms per square metre and the planking shall be at least 50 millimetres in thickness;

(b) if the structure is of timber—

(i) the supporting posts shall be not less than 150 × 75 millimetres in cross-section, spaced not further apart than 2 metres;

(ii) deck-beams and the girders supporting them shall be not less than 225 × 75 millimetres in cross-section, both being placed on edge, and the beams shall be not farther apart than 1,35 metres, centre to centre;

(c) if of steel or other material, the structure shall have a resistance to static and impact loads of not less than that of the timber structure described;

(d) an adequately linked walkway of at least 1,25 metres clear width and 2,15 metres clear height shall be maintained for pedestrians;

(e) the deck shall be built against the face of the building or against a hoarding of the full height of the covered walkway, and shall be closely boarded in such a manner as to prevent any material from falling on the sidewalk;

(f) the temporary offices for the builder's use may be built upon a covered walkway;

(g) the roofs of such offices and the coverings of the walkways shall be inclined towards the building site and have a fall of at least 300 millimetres from the outer to the inner edge;

(h) when the decks of covered walkways are used for the storage of materials or for the platforms for work of any kind, they shall be provided with guard-rails and toe-boards.

HOARDINGS

23. Hoardings used in connexion with building work shall comply with the following requirements—

(a) except as specified otherwise in this section, they shall be not less than 2 metres and not more than 3 metres in height;

(b) the hoardings shall be constructed of boarding or sheeting fixed to a framework, so that no gaps occur between sheets or boards;

(c) the hoardings shall be maintained in good condition, to the satisfaction of the local authority;

(d) timber boards shall be not less than 25 millimetres in thickness and metal sheeting not less than 0,80 millimetre in thickness;

(e) other approved materials shall be of equivalent strength, and shall have no protruding nails or sharp edges projecting on the side facing the street or public place which could injure passers-by;

(f) the uprights shall be firmly embedded in the ground or otherwise fixed, to the satisfaction of the local authority, and rails shall be bolted to uprights;

(g) if material is to be stored against the hoarding, the sheeting shall be fixed on that side of the framing which faces the stored material;

(h) the hoarding shall be designed to withstand the wind forces to which it may be subjected, plus a lateral force of 750 newtons per linear metre, applied at a height of 1,25 metres above the ground;

(i) where a hoarding is situated at the corner of two streets and the local authority so requires, it shall be splayed off at an angle of 45 degrees from the building-line in each street, at points at least 1,5 metres from the intersection of the building-lines, and, subject to the provisions of paragraph (k), the height of the portion of the hoarding so splayed, and of the hoarding along each frontage for a distance of 1,5 metres from the end of the splay, shall not exceed 1,25 metres. Alternatively, the height of the hoarding shall be reduced to 1,25 metres for a distance of not more than 3 metres from the corner of the hoarding;

(j) not more than one opening in any hoarding shall be permitted for each 15 metres of the frontage of such hoarding, and, unless authorized by the local authority, such opening shall not exceed 3,5 metres in width, and the opening shall be provided with sliding doors or doors swinging inwards;

(k) the local authority may, in any particular case, require hoardings or other enclosing structures related to building operations, to be of such different form and construction as it may deem necessary to minimize obstruction to traffic or to prevent danger to the public.

PART IV

CRANES AND OTHER LIFTING-GEAR AND CHUTES

GENERAL PRECAUTIONS FOR LIFTING WORK

24. (1) No load shall be lifted, lowered or conveyed over a street or other public place by means of a crane or other lifting-gear without the written permission of the local authority.

(2) Application for such permission shall be made to the local authority on the form supplied by the local authority for that purpose.[3]

[3]A form of application and permit is set out in the Schedule.

(3) If the local authority is satisfied that it is not practicable to confine lifting, lowering or conveying to within the site, and that the use of such crane or lifting-gear over a street or public place will not endanger the safety of the public, the local authority may grant permission[3] upon such conditions as may be reasonably necessary to safeguard the public.

(4) No material hoist shall be operated in a street or public place, unless it is within a hoarding and written permission for its use has been obtained from the local authority.

PRECAUTION FOR CHUTES

25. A builder or plumber using a chute which projects over a street or public place shall comply with the following requirements—

(a) the vertical height of the chute shall not exceed 6 metres, and the inclination to the horizontal shall not exceed 45 degrees;

(b) the chute shall be entirely enclosed, except at the inlet or outlet openings:

Provided that intermediate openings may be formed in the sides of a chute, but such openings shall be kept closed when the chute is in use;

(c) if an inside dimension of the cross-section exceeds 600 millimetres, the chute shall be constructed of planking of not less than 38 millimetres in thickness or of sheet metal of not less than 3,1 millimetres in thickness, and shall be rigidly supported throughout its height;

(d) baffles or a container shall be provided at the outlet to prevent materials rebounding.

PART V

MISCELLANEOUS SAFETY PRECAUTIONS

TEMPORARY GRANDSTANDS AND SIMILAR STRUCTURES

26. (1) No person shall erect a temporary platform, seat, grandstand or other structure for the accommodation of persons attending a meeting, service, procession or entertainment of any description whatsoever without a permit first had and obtained from the local authority.

(2) The application for such permit shall be in writing and signed by the person making it, and shall be accompanied by full details of such structure, including working-drawings and a certificate from a structural engineer, to the effect that such structure will safely support the loads which it is designed to bear if required by the local authority.

[3] A form of application and permit is set out in the Schedule.

REQUIREMENTS FOR SWIMMING-BATHS[4]

27. (1) Any person who constructs a swimming-bath, to which the public or any class or section of the public are to have access, shall comply with the following requirements—

(a) a hand-hold shall be provided at water-level all around such swimming-bath;

(b) the depth of water shall be not less than 1 metre at any part of such swimming-bath, not including a children's paddling-pool;

(c) the floor of such swimming-bath shall have a slope not exceeding one vertical in 15 horizontal over any portion of it which normally has a depth of water of less than 2 metres;

(d) the surrounds of such swimming-bath shall have a non-skid surface.

(2) If diving-boards are provided, they shall comply with the following requirements—

(a) diving-boards of less than 10 metres in height shall project not less than 1 metre beyond the edge of the swimming-bath, and those 10 metres or more in height shall project not less than 2 metres beyond the edge of the swimming-bath;

(b) a diving-board above or within 3 metres horizontally of a lower diving-board shall project not less than 1 metre beyond the end of the lower diving-board;

(c) except where variations are permitted by the local authority, diving-boards shall have distances and measurements not less than as set out in Table III and in A, E, F, J and K of the Figure with regard to height above water, horizontal spacing, clearance overhead, length and width;

(d) the depth of water provided under diving-boards shall be not less than, and shall extend over, an area not smaller than as set out in Table III and the Figure.

TABLE III

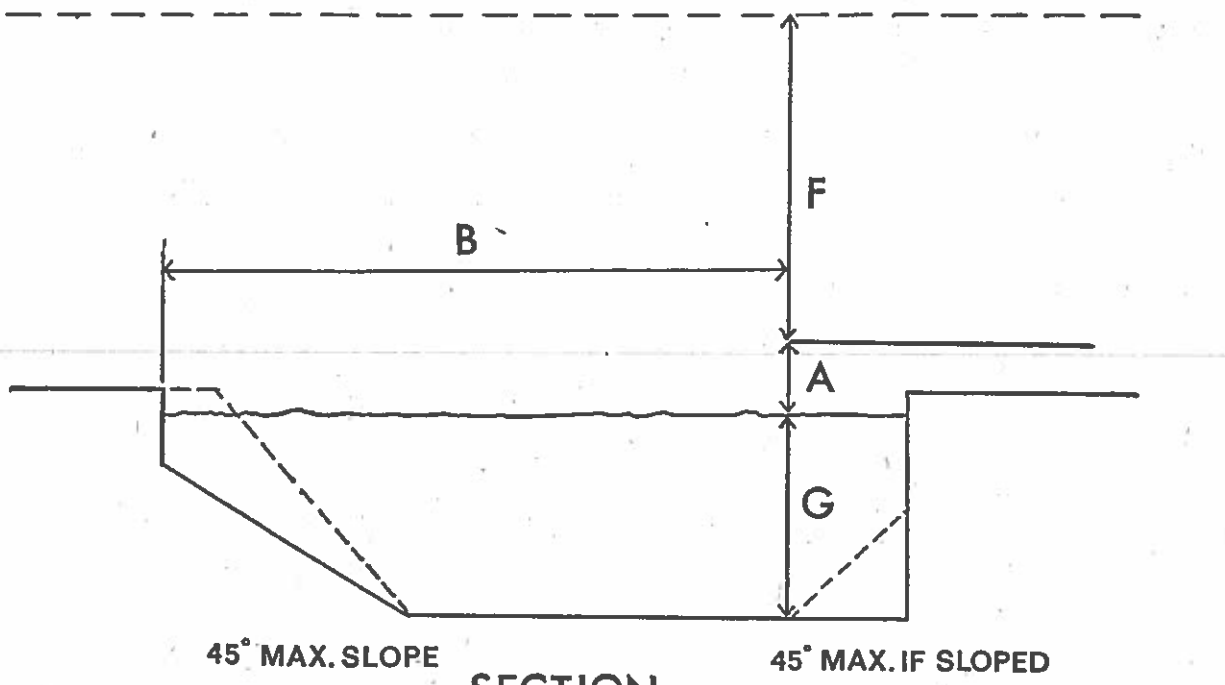
(all measurements in metres)

	Fig. ref.	Spring-boards		Firm platforms		
Height of board above water	A	1,0	3,0	5,0	7,5	10,0
Clearance forward	B	7,5	9,0	10,5	12,0	13,5
Clearance to sides	C	2,5	3,5	3,8	4,2	4,5
Clearance behind	D	1,0	1,0	1,0	1,0	2,0
Centre of adjoining board	E	2,0	2,5	2,5	2,5	2,5
Clearance overhead	F	4,6	4,6	3,8	3,8	3,8
Depth of water	G	3,0	3,5	3,8	4,2	4,5
Depth maintained forward	H	5,3	6,2	7,0	8,5	10,5
Depth maintained at sides	I	2,2	2,7	3,0	3,0	3,0
Length of board	J	4,0	4,0	5,0	5,0	6,0
Width of board	K	0,5	0,5	2,0	2,0	2,0

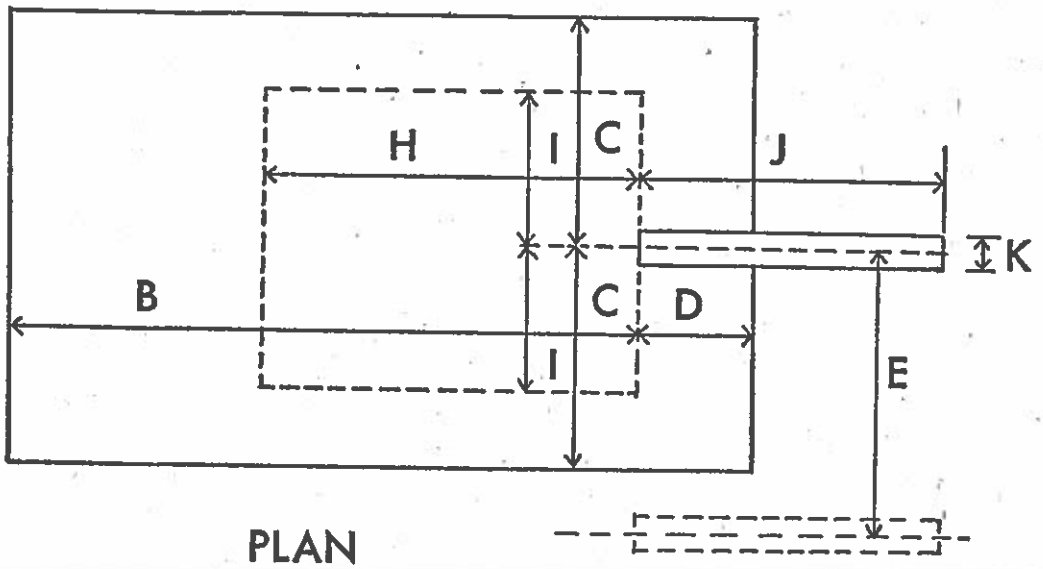
[4] For the Olympic Games, it is customary for the Fédération Internationale de Natation Amateur to specify a depth of 5 metres for the diving-pit. Authorities contemplating the building of a first-class pool with a 10-metre diving-stage would be well advised to provide this depth, which may become compulsory in due course.

FIGURE

REQUIREMENTS FOR SWIMMING-BATHS



SECTION



PLAN

SCHEDULE (*Section 24, footnote 3*)

FORMS

APPLICATION FOR PERMIT TO LIFT, LOWER OR CONVEY LOADS OVER A STREET OR PUBLIC PLACE

(to be completed in triplicate)

To.....
(*insert the name and address of the local authority concerned*)

1. I, ..., being the registered owner of/being the builder about to undertake building work on* the property known as ....., hereby apply, in terms of Chapter 12 of the Model Building By-laws, 1977, for a permit to erect and use certain lifting-gear in connexion with such building work in or over the street(s) and/or public place(s) hereinafter mentioned.

2. I attach hereto a plan on which is shown the site of such building work, together with information under the following headings—
   (a) type of lifting-gear intended to be used;
   (b) position of lifting-gear;
   (c) position where vehicles will stand during loading or unloading by means of such lifting-gear;
   (d) name(s) of street(s) or public place(s) over which such lifting-gear is intended to operate;
   (e) area of such street(s) or public place(s) over which such lifting-gear is intended to operate;
   (f) area to be enclosed in terms of paragraph 3 (a).

3. I hereby undertake—
   (a) to enclose the area referred to in paragraph 2 (f) by means of a hoarding or a guard-rail complying with the Model Building By-laws, during all times that such lifting-gear is in operation, so as to exclude entirely the public from entering such area, and, if a guard-rail is employed, to post men with warning notices of red flags on all approaches to such enclosed area while any load is suspended over such area;
   (b) to ensure that every part of a load lifted, lowered or conveyed over the enclosure referred to in paragraphs 2 (f) and 3 (a) is at all times at least 1 metre within the enclosure, if it is a hoarding, or at least 3 metres within the enclosure, if it is a guard-rail;
   (c) to take all necessary safety precautions relating to the use, maintenance, inspection, testing and operation of such lifting-gear and lifting-tackle, and everything else in connexion therewith;
   (d) to ensure that no lifting, lowering or conveying of loads over the said area shall take place, except in strict accordance with the provisions of the Factories and Works Act [*Chapter 283*], and of the regulations made thereunder;
   (e) to ensure that the said lifting, lowering or conveying of loads takes place within the periods of ..... to ....., and ..... to ....., or otherwise, as required or authorized by the council;†
   (f) to ensure that the foregoing undertakings are observed, *mutatis mutandis*, in the erection and dismantling of the said lifting-gear;
   (g) to comply with any further conditions lawfully imposed by the council and endorsed on the permit issued to me.

4. I hereby indemnify .....
(*insert full name of local authority*)
and hold it harmless in respect of all actions, proceedings, claims, demands, costs, damages and expenses arising, whether directly or indirectly, out of the existence, erection, dismantling or use of the said lifting-gear or anything in connexion therewith.

* Delete the inapplicable.
† The local authority shall enter the times between which the hoisting is to take place.

I hereby select ..... as my *domicilium citandi et executandi*, in respect of all matters concerned with this application.

Signed at ..... on this ..... day of ..... 19.....

Name (in block letters) .....

Signature ..... (owner/builder‡),

in the presence of the under-mentioned witnesses—

Witness (1) .....

Witness (2) .....

‡ Delete the inapplicable. If the owner/builder is a body corporate, a certified copy of the resolution passed by such body, authorizing the signatory to sign the application, should be attached hereto. In all other cases, the local authority should satisfy itself that the signatory is legally entitled to sign this application.

PERMIT TO LIFT, LOWER OR CONVEY LOADS OVER A STREET OR PUBLIC PLACE

The application, of which a copy is hereunto annexed and which is to be read as one with this permit submitted by ....., dated the ..... day of ..... 19.., is hereby granted, subject to the following additional conditions—

.....

.....

.....

.....

This permit expires on .....

Date ....

(title of signatory)

Adv. Jeremy Lewis t/a
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