

Mr. G. A. Dickinson,
P.O. Box 418,
DARWIN. N.T.

THE NORTHERN TERRITORY OF AUSTRALIA

The Building Ordinance 1955



BUILDING BOARD

BUILDING MANUAL

Pursuant to Regulation thirty-three under the *Building Ordinance* 1955 the Building Board has made the determinations contained in this Building Manual and hereby authorizes publication of this Manual as the Building Manual for the purposes of the Building Ordinance and Regulations.

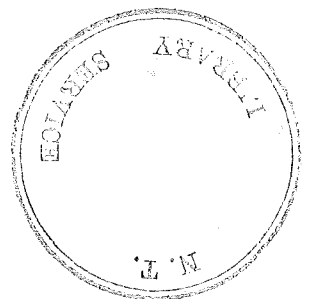
DATED at Darwin this 25th day of November,
One thousand nine hundred and sixty.

R. MARSH
(Chairman.)

A. FORD
(Member.)

L. D. RICHARDSON
(Member.)

1948/62.



	PAGE.
This Building Manual is divided into Chapters as follows:—	
Chapter 1.—Definitions	1
Chapter 2.—Types of Construction	8
Chapter 3.—Site Requirements and Building Heights	11
Chapter 4.—Projections Beyond Street Alignments	18
Chapter 5.—Room Sizes and Heights	21
Chapter 6.—Natural Light and Ventilation	23
Chapter 7.—Materials and Working Stresses	31
Chapter 8.—Fire Resisting Materials	39
Chapter 9.—Live and Dead Loads	46
Chapter 10.—Precautions during Construction and Pulling Down of Buildings	52
Chapter 11.—Dampness and Drainage of Site	55
Chapter 12.—Excavation	57
Chapter 13.—Foundations and Footings	58
Chapter 14.—Walls and Partitions in Types 1, 2 and 3 Construc- tion	63
Chapter 15.—Floors	77
Chapter 16.—Roofs and Roof Structures	79
Chapter 17.—Chimneys, Fireplaces, Flues, &c.	81
Chapter 18.—Reinforced Concrete, Reinforced Brick Masonry and Structural Steel Design and Construction	86
Chapter 19.—Timber Buildings and Construction	96
Chapter 20.—Means of Egress	98
Chapter 21.—Fire Protection of Openings	106
Chapter 22.—Sub-division of Buildings by Fire-resisting Structures	109
Chapter 23.—Special Class Requirements	112
Chapter 24.—Restoration of Buildings and Alterations to Existing Buildings	122
Chapter 25.—Ruinous and Dangerous Buildings	124
Chapter 26.—Fences	125
Chapter 27.—Street Verandahs and Sun Blinds	126
Chapter 28.—Storage of Inflammable Liquids, Dangerous Goods, &c.	128
Chapter 29.—Sanitation	133

NORTHERN TERRITORY BUILDING MANUAL.

CHAPTER 1.

DEFINITIONS.

1. "Adjoining occupier" means the occupier, or one of the occupiers, of land, buildings, stories, or rooms adjoining those of the building owner.
2. "Adjoining owner" means the owner, or one of the owners of buildings, stories, or rooms adjoining those of the building owner, or the lessee of land adjoining that of the building owner.
3. "Administrator" means the Administrator of the Northern Territory or the person for the time being occupying that position.
4. "Alteration" includes alteration, addition and extension and "alter" has a corresponding meaning.
5. "Arcade" means a right-of-way or passage, whether open to the sky or not, on to which shops or offices open on either one or both sides.
6. "Architect" means a person qualified and registered under the provisions of an Act of Parliament of any State or an Ordinance of any Territory within the Commonwealth of Australia, requiring registration of Architects within that State or Territory, or possessing qualifications suitable for corporate membership of the Royal Australian Institute of Architects.
7. "Area" applied to a building means the superficial area of a horizontal section thereof made at a point of greatest surface, inclusive of the external walls and of such portions of any party wall as belong to the building.
8. "Assembly building" means any building in which persons congregate for civic, political, educational, religious, social, or recreation purposes, or for entertainment or amusement.
9. "Attic" means any floor area built wholly or partly in the roof of a building, but an attic shall not be regarded as a story if it is wholly contained within a roof pitched at the level of the ceiling of the story next below the attic.
10. "Authorized" means authorized by the Board for the purposes of the Regulations.
11. "Basement" means that portion of a building constructed below ground level, or so constructed that the height of the ceiling above the level of the adjoining ground or pavement is less than the distance from such level to the floor, measured in the centre of the building frontage.

12. "Base structure" means that structure between the level of the lowest floor and the footings which transmits the loads of the building to the footings.
13. "Builder" means the person or persons employed to erect or construct any building or structure, or to demolish, alter or execute any work on a building or structure already erected, and shall include the owner or occupier of the land upon which any such building or structure is or is intended to be erected or constructed, or other persons for whom, or by whose order or under whose direction and control such alteration or work was done or is intended to be done, as the case may be.
14. "Chief Fire Officer" means a person appointed to be the "Chief Fire Officer" under the *Fire Brigades Ordinance 1956* and includes a person appointed to act as Chief Fire Officer under the *Fire Brigades Ordinance 1956*.
15. "Common dining room" means a dining room situated in a building of Class II. or Class III. Occupancy, and intended primarily for the use of residents of such building.
16. "Construct" includes build, reconstruct, rebuild, convert, and alter, and do any structural work, and "construction" has a corresponding meaning.
17. "Cubical extent" applied to the measurements of a building means the space contained within the external surfaces of its walls, and the upper surface of the floor of its lowest story and the topmost ceiling, or the level of the top of the roof plate where there is no ceiling.
18. "Dangerous business" shall mean and include the manufacture of any substance liable to sudden explosion, inflammation or ignition.
19. "Dead load" of a building means the actual weight of all permanent structural and finishing work, including partition walls contained in the building.
20. "Depth" in relation to site means the distance between the middle points of the frontage and of the rear boundary.
21. "Dual house" means a building consisting of two stories and containing one dwelling in each story.
22. "Duplex house" means a building comprising two dwellings each being complete and self-contained.
23. "Fire resistance rating" means the minimum period of time during which an element of a structure may be expected to function satisfactorily while subjected to the Standard Fire Test as provided in Clause 801.
24. "Flat" means that portion of a building used or intended, adapted or designed for use as a separate dwelling.

25. "Footing" means the construction whereby the weight of the structure is transferred from the base structure to the foundation.
26. "Foundation" means the ground upon which the footings of a building are constructed.
27. "Frame construction" means the form of construction in which the design provides that the vertical forces due to the weight of the building or structure and the live load are carried down to the foundation by means of columns in such a manner that the walls are not required to assist in supporting those forces and loads.
28. "Frontage" means the boundary line or lines between the site and the street or streets upon which the site abuts.
29. "Habitable room" includes every room in which any person sleeps or eats or carries on his usual domestic business or social vocations or avocations. Laundries, bathrooms, water closet compartments, serving and storage pantries and closets, boiler rooms, cellars, corridors, and similar spaces used neither frequently nor during extended periods shall be deemed as not coming within the scope of this term.
30. "Height"—
 - (a) in relation to a building means the measurement taken from the permanent footpath level immediately in front of the centre of the face of the building to the level of the top of the eaves, parapet or flat roof whichever is the highest. In the case of buildings of Classes I. and II., the height shall be measured from the mean level of the ground immediately in front of the building;
 - (b) in relation to a building when defined in terms of number of stories means the number of stories above the permanent footpath level, or, where there is a basement, above the basement;
 - (c) in relation to stories means the measurement from one floor to the floor above, or in the case of the topmost story the measurement from one floor to ceiling, provided that if there is no ceiling the height shall be measured from the floor to the underside of the roof tie, or if there is no tie, to the level of half the vertical height of the rafters or other support of the roof;
 - (d) in relation to a room means the height measured from the floor to ceiling, or where there is no ceiling to the underside of the rafters measured at the lowest level of such rafters, or of the floor joists of the floor next above.
31. "High hazard occupancy" means any occupancy involving a dangerous business or in which are goods or materials which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are likely to arise or occur in event of fire.
32. "House" means any building used or intended, adapted or designed for use as a separate dwelling but does not include a flat.

33. "Institutional building" means any building into which persons are admitted to receive care or treatment.
34. "Length of wall" in relation to requirements for wall thickness means the distance of any wall between the nearer faces or cross walls, external walls, or party walls bonded into such walls and constructed in accordance with this Building Manual.
35. "Live load" means all load other than dead load and includes wind load.
36. "Masonry" means stone, brick, terracotta block, solid or hollow concrete block or other similar building unit or combination of same laid unit by unit and set in mortar.
37. "Mezzanine floor" means an intermediate floor placed in any story provided that the area of all mezzanine floors in any story or room shall not exceed one-third of the total floor area in the story or room.
38. "New building" includes—
 - (a) any building erected after the date of this Building Manual;
 - (b) any building which has been taken down entirely or for more than one-half of its cubical extent, and has been re-erected, or commenced to be re-erected, wholly or partially, whether on the same site or elsewhere, after the date of this Building Manual; and
 - (c) any space between walls and/or buildings which is roofed or commenced to be roofed, after the date of this Building Manual.
39. "Occupancy" means the purpose for which a building is used or intended to be used, but change of occupancy is not intended to include change of tenants or proprietors.
40. "Occupation" means a continuous floor area in a building held by one occupier and containing within such area only one class of occupancy.
41. "Owner" means the person for the time being entitled to receive the rent of the land or premises in connexion with which the word is used (whether on his own account or as the agent of or as trustee for any other person) or who would be entitled to receive the same if the land were let at a rent.
42. "Parapet" means that portion of any wall which is carried up above the line of junction with a roof or gutter.
43. "Party structure" means any partition wall or floor required to have a fire resistance rating and used for the purpose of separating stories or rooms in separate occupations or occupancies.
44. "Plot ratio" means the ratio of the gross total of all floor areas including roofed verandahs and enclosed areas at ground level to the area of the land within the title boundaries.
45. "Qualified Engineer" means a corporate member of the Institution of Engineers, Australia, or a corporate member of any other civil and/or structural institution recognized by the Institution of Engineers, Australia.

46. "Reinforced concrete" means concrete containing reinforcement embedded in such a manner that the two materials act together in resisting forces and complying with the requirements of Clause 1801.
47. "Repair" means the reconstruction or renewal of minor parts of an existing building for the purpose of its maintenance but does not cover any change of construction, or major repairs affecting the construction.
48. "Roadway" in relation to any street or way means and includes the whole space open for traffic, whether carriage traffic and foot traffic, or carriage or foot traffic only.
49. "Road classifications." Major, minor and Service Roads where mentioned in this Building Manual shall be those declared by the Board in a schedule available for public inspection.
50. "S.A.A. Code or Specification" means the specified code or specification issued by the Standards Association of Australia and amendments thereto in force at the time of issue of a building permit.
51. "Schedule". Reference to a schedule, form or certificate means reference to a schedule, form or certificate in the appendix to the Building Regulations.
52. "Semi-detached dwelling" means one unit of a two-unit dwelling separated from the other unit by a party wall.
53. "Shop front" means such portion of the structure of a shop as abuts or faces a street, arcade or way and is not in the nature of a wall supporting a wall or portion of a wall above, and shall be deemed to include the frame and glass, doors and door frame, entrance and entrance floors, facing to piers or pilasters, fascia, wall between head of shop front frame underneath the verandah or lintel over openings, and any signs or trade marks incorporated in the design of the shop front.
54. "Sky-sign" means any model, sign, lettering or device in the nature of an advertisement, announcement, or direction supported on, or attached to any building post, pole, standard, framework, or other support so that any part of the sky-sign is visible against the sky from some point in any street or way. The term does not include any flag, flagstaff, pole, aerial, vane, weathercock, cresting, or balustrade.
55. "Sprinkler system" means an automatic sprinkler installation conforming to the requirements of the S.A.A. Code C.A. 16—Rule for Automatic Sprinkler Installations.
56. "Square" applied to the measurement of any area means 100 square feet.

57. "Story" means the space or distance or portion of a building included between the underside of a concrete or fire-resisting floor or the floor joists of any other floor and the underside of the concrete or fire resisting floor or floor joists next above it, or the underside of the tie beam, or collar tie, or half the vertical height of the rafters above, as the case may be, but a gallery or mezzanine floor shall not be deemed to divide a wall or buildings into stories.
- "Basement or Basement story" means any story of a building which is under the ground story.
- "First story" means that story of a building which is next above the ground story, the successive stories above the first story being the second story, the third story and so on to the topmost story.
- "Ground story" means that story closest to the ground level in which the height of the ceiling above the level of the adjoining ground is greater than the distance from such level to the floor measured at the centre of the building frontage.
- "Topmost story" means the uppermost story whether constructed partly in the roof or not.
58. "Street" means—
- (a) any public street or public road;
 - (b) any private street or private road which is dedicated to the public or which is vested in or under the control of the Council;
 - (c) any street, road, lane, footway, square, court or alley, to or over which the public has right of access or use.
59. "Street alignment" means the line of demarcation between any street and an allotment of land abutting thereon.
60. "Subdivision plan" shall be a plan prepared under the authority of the Surveyor-General N.T. Administration, showing the approved set-out of any building lots available for sale, leasing or reserved for other purposes in any area. The building lots shall be numbered and have dimensions and area figured thereon together with widths of roads, easements, &c., shown.
61. "Sunblind" means a screen or awning attached to the wall of a building, and having no support from the ground other than such building and capable of being extended from such building over or across any public footway or part thereof for the purpose of shade, or rolled up on a roller fixed to the face of such building or structure.
62. "The Board" shall mean the Building Board established under the *Building Ordinance 1955*.
63. "Verandah" includes any screen, awning, portico, porch, shade, covering or other erection upon or over or across any public footway or part thereof together with the supports other than the building to or against which it is attached.
64. "Vertical opening" means an opening in a floor between stories of a building, or in a ceiling between a story and a roof space, including openings for stairs, lifts and air wells, but not including openings for pipes, heating or ventilating ducts, or electrical conduits.

65. "Walls"—

"Bearing wall" means a wall which supports any load in addition to its own weight.

"Cross wall" means an internal wall dividing party or external walls into distinct lengths.

"External wall" means an outer wall or vertical enclosure of a building, not being a party wall.

"Fire wall" means a wall which subdivides a building to resist the spread of fire.

"Non-bearing wall" is a wall which supports no load other than its own weight.

"Panel wall" is a non-bearing wall in frame construction built between columns or piers and wholly supported at each story.

"Partition wall" means an internal vertical structure used solely for the purpose of subdividing any story of a building into sections and which supports no load other than its own weight.

"Party wall" means a wall forming part of a building and used or constructed to be used in any part of its height or length for the separation of adjoining buildings.

"Retaining wall" is any wall used to resist the lateral displacement of any material.

66. "Width of frontage" means the shortest distance between the terminal points of the side boundaries where they abut on the street alignment.

CHAPTER 2.

TYPES OF CONSTRUCTION.

- Clause 201. Type of Construction.
- Clause 202. Fire Resistance Rating.
- Clause 203. Construction to Accord with Requirements for Specified Type.
- Clause 204. Buildings of Mixed Construction.
- Clause 205. Type 1.—Framed Fire Resisting Construction.
- Clause 206. Type 2.—Bearing Wall Protected Construction.
- Clause 207. Type 3.—Partially Protected Construction.
- Clause 208. Type 4.—Unprotected Metal Construction.
- Clause 209. Type 5.—Wooden Construction.

EXCEPTIONS.

- Clause 210. Exception in Case of Mezzanine Floors.
- Clause 211. Roof Structures.

CHAPTER 2.

TYPES OF CONSTRUCTION.

201. **Type of Construction.**—For the purposes of this Building Manual buildings shall be divided into the following types of construction based upon their resistance to fire:—

- (1) Framed Fire Resisting Construction.
- (2) Bearing Wall Protected Construction.
- (3) Partially Protected Construction.
- (4) Unprotected Metal Construction.
- (5) Wooden Construction.

202. **Fire Resistance Rating.**—Type 1 shall be deemed to be the most fire resistive and Type 5 the least fire resistive type of construction.

203. **Construction to Accord with Requirements for Specified Type.**—Where a building is required by this Building Manual to be of any given type of construction, it shall be constructed in accordance with the requirements specified below for that type.

204. **Buildings of Mixed Construction.**—A building may contain more than one type of construction but where two or more types of construction occur in the same building and are not separated by a complete fire separation conforming to the provisions of Chapter 22, the whole building shall be regarded as that one of such types of construction offering least resistance to fire provided that in every building containing more than one type of construction, and in every building of Type 3 Construction—

- (a) the support to any wall shall have a fire resistance rating of such wall;
- (b) the support to any floor or roof shall have a fire resistance rating at least equal to the fire resistance rating of such floor or roof;

- (c) the support to any wall, floor or roof referred to in sub-clauses (a) and (b) hereof shall mean the direct support and shall not include any lateral members of a floor system connected to such wall, floor or roof.

205. Type 1—Framed Fire Resisting Construction.—Framed fire resisting construction means that type of construction described in Chapter 8 in which the imposed loads are carried on columns and beams or on reinforced concrete walls where same are used for shaft enclosures around stairs or lifts or other vertical openings, and in which structural members are of incombustible materials having an ultimate fire resistance of not less than, in the case of—

- (a) columns (including reinforced concrete walls acting as columns), internal structural members which carry walls and fire and party walls—4 hours;
- (b) exterior panel walls, beams, girders, trusses, floors and roofs (except as qualified in Clause 1602)—3 hours;
- (c) non bearing shaft enclosures around stairs, lifts, and other vertical openings—3 hours.

206. Type 2—Bearing Wall Protected Construction.—Bearing wall protected construction means that type of construction in which the walls are of masonry or reinforced concrete and structural members are of incombustible material, having an ultimate fire resistance of not less than, in the case of—

- (a) fire walls and party walls—4 hours;
- (b) bearing walls, piers, trusses other than roof trusses, and columns and girders supporting walls—3 hours;
- (c) panel walls, columns and girders not otherwise specified and shaft enclosures around stairs, lifts and other vertical openings—2 hours;
- (d) roof trusses and roofs including beams and girders (except as qualified in Clause 1602)—2 hours;
- (e) floors (including beams, girders and trusses)—2 hours.

207. Type 3—Partially Protected Construction.—Partially protected construction means that type of construction having external walls with a fire resistance rating of three hours and walls of lift wells with a fire resistance rating of two hours, constructed of masonry, concrete, reinforced concrete, steel encased in concrete, or other hard and incombustible material, and in which the interior framing and construction are partly or wholly of wood or unprotected iron or steel or of reinforced concrete supported on unprotected steel.

208. Type 4—Unprotected Metal Construction.—Unprotected metal construction means that type of construction in which the imposed loads are carried on an unprotected metal frame and in which the exterior walls and roof are of sheet metal or other incombustible substances.

209. Type 5—Wooden Construction.—Wooden construction means that type of construction in which the structural parts and materials are of wood or are dependent upon a wooden frame for support.

EXCEPTIONS.

210. **Exception in Case of Mezzanine Floors.**—Notwithstanding anything contained elsewhere in this Chapter, mezzanine floors may be of timber or unprotected steel supports or of unprotected steel or iron as provided in Clause 1506 (c); where such mezzanine floors provide egress in the event of fire, they shall be constructed of fire resisting materials.

211. **Roof Structures.**—Structures not exceeding 10 feet either in length or in width and not exceeding 8 feet in height and intended for the protection of lift ventilating machinery or for like purposes may be erected above the level of the roof of a building of Type 1, 2 or 3 Construction with external walls constructed in masonry not less than 4 inches thick and with a roof of impervious material.

CHAPTER 3.

SITE REQUIREMENTS AND BUILDING HEIGHTS.

- Clause 301. Vehicular Access to Allotments.
- Clause 302. Parking.
- Clause 303. Interpretations.
- Clause 304. Distance from Street Alignments in Residential Districts.
- Clause 305. General Site Restrictions—Buildings Class I, II, and III.
- Clause 306. Site Restrictions—Class I.
- Clause 307. Site Restrictions—Class II.
- Clause 308. Site Restrictions—Class III.
- Clause 309. Site Restrictions—Class IV.
- Clause 310. Site Restrictions—Class VI., Shops.
- Clause 311. Site Restrictions—Class I. and VI. (Shops and Private Dwellings Combined.)
- Clause 312. Buildings of Class V., VI., VII. and VIII. Occupancy.
- Clause 313. Buildings of Class IX. Occupancy (Public Buildings).
- Clause 314. Rear Access.
- Clause 315. Measurement of Height.
- Clause 316. Width of Street.
- Clause 317. Maximum Building Height.
- Clause 318. Decorative Features.
- Clause 319. Height of Type 1 and Type 2 Construction.
- Clause 320. Height of Other Types of Construction.
- Clause 321. Additional Stories to Floors of Existing Buildings.

CHAPTER 3.

SITE REQUIREMENTS AND BUILDING HEIGHTS.

301. **Vehicular Access to Allotments.**—Footpath crossings.—No footpath crossings for vehicular access to allotments will be permitted from major or minor roads where such allotments are also served by roads of lesser traffic importance.

302. **Parking.**—No building shall be so designed as to require vehicles to remain stationary at the kerb in any major road to deliver or receive passengers or goods. Where such facilities are necessary to buildings on allotments having sole access from major roads portion of the allotment shall be set aside for this purpose.

303. **Interpretations:** (a) **Frontage to Sites—General Conditions.**—For the purpose of this Building Manual the width of the frontage of any land shall be deemed to be the distance measured in a horizontal plane at right angles to one of the boundaries of the side of the land from its intersection with the alignment of the street to the opposite boundary of the land or a prolongation of the boundary.

In the event of the side boundaries of the land not being parallel the average of the distances so measured shall be the width of the frontage.

(b) **Frontage to Corner Sites.**—Where a corner of an allotment at the junction or intersection of any street has been truncated—

- (i) the width of the frontage shall be measured from a point at the intersection of the prolongation of the side and front boundaries of the allotment;
- (ii) the area shall be calculated as if the land thereby excised were a portion of the allotment.

(c) **Measurement of a Distance from a Boundary.**—Wherever the minimum distance is provided for, such distance shall be measured horizontally from the boundary to the outermost projection from the exterior wall, except that where a chimney back not more than 5 ft. 6in. in width is projecting, the extent of the projection shall be determined by the horizontal distance by which it exceeds 14 inches.

(d) For the purpose of this clause the length of a wall is its total length measured as if it were continuous in one plane irrespective of any projections or set-backs between the exterior faces of outside walls of the building.

Nothing in this clause shall prohibit the length of a portion of a wall containing windows of habitable rooms being measured independently from the portion of the wall not containing windows of habitable rooms.

304. Distance from Street Alignments in Residential Districts.—(a) No person shall erect or construct in a residential district any building or any addition to any building within the space, if any, between the street boundary of any site and the building line as fixed by the local authority for that particular street or part thereof. Subject to the foregoing and where no building line has been fixed by the Board, the minimum distance between any building or any addition to any building and the boundary of the street it faces shall be 25 feet.

(b) Such building line shall, when fixed by the Board, be marked upon a plan or clearly described in a resolution of the Board and such plan or description shall be open for inspection by the public free of charge.

(c) Alterations may be made by the Board where levels or depth of the allotment or other exceptional conditions of the site or the nature of the building or position of existing adjoining building make it necessary or expedient to alter the building line in respect of any part of the building or buildings.

305. General Site Restrictions Applying to Buildings of Class I, II, also to Buildings of Class III, where Permitted by the Board to be Erected in Residential and Residential Flat Areas.—(a) No person on any site on which one or more buildings of Class I, II, or III. Occupancy have or shall be erected shall erect thereon any other buildings of any of such classes unless the said site shall be subdivided so as to provide a separate site satisfying all the requirements of the provisions of this Building Manual for each of such existing buildings as well as for each of the buildings intended to be so erected.

(b) In any case where a building of any of the aforesaid classes has been or shall be erected at a distance from the frontage, no person shall erect a building of any kind in the space or any part of the space immediately between such former building and the frontage, otherwise than as an addition to or extension of such building. Provided that this clause

shall not prohibit the erection of a building on a site which is the subject of a Certificate of Title to the site on which the first mentioned building is erected.

(c) Eaves may project up to a distance of 2 ft. 6 in. from walls without requiring the wall to be set back further than is required by this Manual subject to the provision that no eave shall be closer than 2 ft. 6 in. to a site boundary. The eaves projection shall be measured at right angles from the external face of the wall to the back of the gutter.

306. Site Restrictions for Buildings of Class I.—No person shall hereafter erect a building of Class I. Occupancy otherwise than in accordance with the following requirements:—

- (a) Except as provided in Clause 311 (c) the site shall have an area of not less than 6,000 square feet and a frontage of not less than 49 ft. 6 in. in the case of single occupancy dwellings and an area of not less than 8,000 square feet and a frontage of not less than 66 feet in the case of duplex houses.
- (b) No building of Class I. shall be constructed with any wall of any store at a less distance from a boundary of the site other than a street boundary than 5 feet. In the case of buildings not exceeding two stories in height or 50 feet in length, such distances shall be increased by 1 foot for each 10 feet by which the wall exceeds 50 feet in length.
- (c) No building of Class I. Occupancy including buildings appurtenant thereto shall hereafter be constructed in such a way that the total gross area of such building or buildings shall exceed a plot ratio of 0.33 ($\frac{1}{3}$) as provided in Clause 317 (d).

The area occupied by the building shall include the areas occupied by outbuildings but not unroofed terraces.

307. Site Restrictions for Buildings of Class II.—Residential Flat Buildings.—No person shall hereafter erect a building of Class II. Occupancy otherwise than in accordance with the following requirements:—

- (a) Subject to compliance with the provisions of sub-clause (e) of this clause, the minimum distance of walls from the side or rear boundaries of the site shall be 10 feet for a building not exceeding three stories or 30 feet in height and 40 feet in length. Such distance shall be increased by 2 ft. 2 in. for each additional 10 feet or part thereof by which such wall exceeds 60 feet in length provided that no such wall shall be required to be at a greater distance than 35 feet from the side or rear boundaries.

The distance from the side boundary, as required by this clause for a building not exceeding three stories in height, shall be increased by 5 feet for every additional story or height of 10 feet by which any building exceeds three stories in height.

- (b) Walls in which there are no windows of habitable rooms may be located one half the distance from the side or rear boundaries required by sub-clause (a) of this clause provided that no such wall shall be erected closer than 5 feet from such boundaries in compliance with the provisions of sub-clause (d) of this clause.
- (c) Walls of buildings not parallel with the side boundaries may be built so that their average distance from the boundaries complies with sub-clauses (a) and (b) of this clause irrespective of their length; provided that in no part of their length are they closer to the boundaries than is required for a wall of the same height not exceeding 40 feet in length.
- (d) There shall be a drying area of at least 20 ft. x 20 ft. for each laundry. Such drying area shall be located at the rear or side of the building.
- (e) No external walls facing each other, one or both of which contain windows of habitable rooms, shall be less than 20 feet apart. In the case of walls fronting opposite sides of courts or areas 20 feet or more in depth, the width of the court or area shall be increased to not less than twice the distance from the side boundary to the side walls required by sub-clause (b) of this clause.
- (f) The Board shall declare plot ratios not exceeding one to apply to various areas. (As provided in Clause 317 (d).)
- (g) The Board may prescribe frontages for flats provided that no residential flat building shall hereafter be erected on a site with a frontage of less than 66 feet.

308. Site Restrictions Applying to Buildings of Class III.—(a) Where the zoning Regulations permit the erection of buildings of Class III. in residential areas such buildings shall comply with the provisions of Clause 307.

(b) Every residential club or hotel erected in business and other areas zoned for commercial or similar purposes shall hereafter be constructed in such a way that it shall occupy not more than 66 per cent. of the total area of the site, which has a frontage to one street, 75 per cent. where there is a frontage to two streets and 80 per cent. where there is a frontage to three streets.

The whole of the site may be occupied by the ground floor provided that no part of the ground floor shall be used for sleeping purposes and that natural light is provided in accordance with this Manual and adequate natural or artificial means of ventilation is provided to the approval of an officer authorized by the Board.

309. Site Restrictions Applying to Class IV. Occupancy.—Every building of Class IV. Occupancy shall have constructed therewith for the use of the occupants a space open to the air without roof. Such open space—

- (i) shall have an area of not less than 450 square feet;
- (ii) may be provided in the form of a flat roof higher than that of the floor of the ground story;
- (iii) shall be of a dimension of not less than 10 feet in any direction.

310. Site Restrictions for Buildings of Class VI. Occupancy (Shops).—No person shall hereafter erect any building of Class VI. Occupancy otherwise than upon a site satisfying the following requirements:—

- (a) The area of the site shall be not less than 2,000 square feet.
- (b) The width of the frontage of the site shall be not less than 16 ft. 6 in.

311. Site Restrictions for Buildings of Class I. and VI. Occupancy (Shops and Private Dwellings Combined).—(a) No person shall hereafter erect any shop and dwelling house combined otherwise than upon a site satisfying the following requirements:—

- (i) The area of the site shall be not less than 6,000 square feet.
 - (ii) The width of the frontage of the site shall be not less than 49 ft. 6 in.
- (b) No shop or shops shall be built or erected in front of any dwelling house unless the following conditions are complied with:—
- (i) Such shop shall be connected to the dwelling house so that when completed the whole shall form one building and be in one occupation.
 - (ii) The dwelling house shall have a clear uninterrupted frontage of not less than 15 feet provided that the Board may permit the dwelling house to be located on the first floor over the shops with an unobstructed frontage and a separate fire-isolated staircase for the dwelling house leading to the street.
- (c) The Board may permit—
- (i) a building of Class I. Occupancy (Private dwellings) or a shop or a shop and dwelling combined, as the case may be, to be erected on any site similar in area than hereinbefore prescribed, provided that such site comprises the whole of any lot shown on a plan of subdivision approved by the appropriate authority prior to the carrying into operation of this clause, or
 - (ii) a building of Class I. or II. Occupancy or a shop and dwelling combined to be erected on a site not less than 6,000 square feet in area which has been reduced below that hereinbefore prescribed by severance due to resumption by the Appropriate Authority for street widening or other purposes.
- (d) Shops having dwellings attached shall be provided with open spaces as required for a private dwelling of Class I. Occupancy.

312. Buildings of Class V., VI., VII. and VIII. Occupancy.—In the case of buildings of Class V., VI., VII. or VIII. Occupancy the Board may permit the ground floor thereof to occupy the whole of the site, provided that lighting is provided in accordance with this Manual and that adequate natural or artificial means of ventilation is provided to the approval of an officer authorized by the Board.

313. Buildings of Class IX. Occupancy (Public Buildings).—In the case of buildings of Class IX. Occupancy all particulars and plans are to be submitted for approval by the Board.

314. **Rear Access.**—Every building of Class VI. Occupancy (Shop) or a shop and dwelling combined or buildings of Class VII. or VIII. Occupancy hereafter erected shall be provided with means of access for the removal of rubbish and servicing to every separate tenement and/or shop, warehouse or factory within the building. Such means of servicing shall be provided in such a manner that every separate tenement or occupancy can be serviced without passing through the front entrance thereof or through any other shop or tenement or in the case of arcades through the arcade street entrance.

BUILDING HEIGHT RESTRICTIONS:

315. **Measurement of Height.**—See definition in Chapter 1.

316. **Width of Street.**—The width of street shall be determined for the purposes of Clause 317 by measuring at right angles from the building line at the centre of the frontage of the building to the opposite building line of the street.

317. **Maximum Building Height.**—(a) No portion of any building shall project beyond the continuation of a line drawn from the ground level at the building line on the opposite side of the street to a point at the centre of such building vertically above the building line thereof at a height equal to twice the horizontal distance between such building lines.

(b) **Frontage to Two Streets of Equal Width.**—The maximum building height in respect to a site having a frontage of two streets equal in width shall be taken from the permanent footpath level at the centre of the frontage to the street at the higher level.

(c) **Frontages to Two Streets of Different Widths.**—The maximum building height in respect to a site having frontages to two streets differing in width shall be determined by the wider street for a depth of twice the width of the street from such wider street and by the narrower street for any balance of the depth from such wider street.

(d) **Maximum Heights and Plot Ratios.**—The Board shall fix plot ratios for the various districts. The heights of buildings and/or plot ratios shall not exceed the values set out hereunder:—

(i) In single occupancy residential districts so designated by 30 feet in height and a plot ratio of .33 ($\frac{1}{3}$) in the case of single occupancy dwellings and .5 ($\frac{1}{2}$) in the case of duplex and dual houses.

(ii) In residential flat districts the plot ratio shall not exceed one.

(iii) In all other districts the plot ratio shall not exceed five.

318. **Decorative Features.**—The following erections shall not be included in measuring the height of buildings, namely:—

Ornamental towers, spires, domes, architectural features or decorations, lift machinery rooms, bulkheads, pent houses, overstairs or other superstructures erected above the main roof of the building.

Provided, nevertheless, that no such erection exceeding in width one fourth of the frontage of the building shall project beyond the maximum height as prescribed in Clauses 317, 319 and 320 of this Building Manual.

319. Height of Type 1 and Type 2 Construction: (a) Framed Fire Resisting Construction.—Buildings of Type 1 Construction may be erected to a maximum height permitted by Clause 317.

(b) Bearing Wall Protected Construction.—Except as provided in Clause 318 hereof, no building of Type 2 Construction shall be of a greater height than 90 feet.

320. Height of Other Types of Construction.—(a) Except where otherwise authorized by the Board, buildings of Type 3, 4 or 5 Construction shall not be erected to contain a greater number of stories than that set out in Table 320.

(b) A building of Class IV. Occupancy shall not be constructed above the first floor in any building of Type 3 Construction.

TABLE 320.

Type of Construction.	Class of Occupancy.	Maximum No. of Stories.
Type 3 (Ordinary construction) . .	I., II., III., IV., V., VI., VII., VIII., IX.	2
Type 4 (Unprotected metal construction)	VII., VIII. where specially approved by Local Authority	1
Type 5 (Wood frame construction)	I.	2
(where specially approved by Local Authority)	VIII.	1

(c) Number of Stories Not to Include Basements.—The number of stories referred to in Table 320 shall be exclusive of a basement provided that the ceiling of any such basement is not more than 4 feet above the pavement level at the front of the building.

(d) Mezzanine Floors.—Mezzanine floors complying with the requirements of Clause 1506 shall not be considered as a story.

(e) Height of Stories.—For the purpose of Table 320 a story exceeding 20 feet in height in a building of any class other than Class IX. shall be considered as two stories.

(f) Ground Floors in Reinforced Concrete. Ground floors of all buildings of Class V., VI., VII., VIII. and IX. constructed with basements shall be of reinforced concrete.

321. Additional Stories to Floors of Existing Buildings.—Additional stories may be added to buildings of Type 3 Construction provided such floors comply with the provisions of Table 320.

CHAPTER 4.

PROJECTIONS BEYOND STREET ALIGNMENTS.

- Clause 401. Projections to be Fire-resisting.
 - Clause 402. Minimum Height Above Pavement.
 - Clause 403. Limits of Projection.
 - Clause 404. Windows, Balconies, etc.
 - Clause 405. Timber Window Shutters.
 - Clause 406. Cat Heads.
 - Clause 407. Loading Docks and Platforms.
 - Clause 408. Service and Rainwater Pipes.
 - Clause 409. Pavement Lights.
 - Clause 410. Gates, Doors, &c., Abutting on Street.
-

CHAPTER 4.

PROJECTIONS BEYOND STREET ALIGNMENTS.

401. **Projections to be Fire-resisting.**—(a) Except as provided in Chapter 23, every coping, cornice, string, course, fascia, window dressing, portico, balconette, bridge, connecting buildings, balustrade, architectural projections, and architectural decoration projecting beyond the street alignment shall be of brick, tile, stone, artificial stone, slate, cement, concrete or other fire-resisting material approved for the purpose by an officer authorized by the Board.

(b) No such projection shall form part of the structural design of the building.

(c) Eaves, soffits, and barge boards to any overhanging roof, if within 2 ft. 6in. of any adjoining building or land in other occupation shall be of fire-resisting materials, unless separated by brickwork at least 9 inches thick, or reinforced concrete 4 inches thick, and projecting 4 inches beyond the woodwork.

(d) No pitched roof shall project over any street or way and all pitched roofs within 2 feet of any street or way shall be protected by a parapet.

(e) For Cantilever Verandahs *see* Chapter 27.

402. **Minimum Height Above Pavement.**—Except as provided in Chapters 7 and 17, no projection shall extend beyond the street alignment at any height less than 9 feet from the level of the public footway, measured at the street alignment.

Plinths of buildings erected prior to the coming into force of this clause not exceeding 2 feet in height may project 2½ inches beyond the street alignment. No face or plinth of any building hereafter erected shall project beyond the street alignment.

403. **Limits of Projections.**—No part of any projection shall extend beyond the street alignment more than—

- (a) 3 feet in a street exceeding 40 feet in width.
- (b) 2 feet in streets 40 feet or less in width.

No projection shall be permitted in streets or rights-of-way less than 20 feet in width.

404. **Windows, Balconies, &c.**—A balcony, balconette, window or turret may project not more than 3 feet beyond the street alignments in streets over 40 feet in width or more than 2 feet in streets from 33 feet to 40 feet in width provided that—

- (a) no part of any such projection where it overhangs a street shall be less than 9 feet above the level of the street or be nearer than 4 feet to the centre of the nearest party wall or to any adjoining building or land not in the same occupation;
- (b) the total width of any such projections taken together shall not exceed one-half of the length of the wall of the building on the level of the floor on which such projections are made;
- (c) no projecting window shall exceed a total overall width of 12 feet and the distance between projecting windows shall not be less than one-half of the total overall width of each of such windows;
- (d) projecting windows shall not be connected by a balcony any portion of which projects beyond the street alignment;
- (e) every such projection shall be constructed of fire-resisting materials to the satisfaction of an officer authorized by the Board. No such projections shall be permitted in streets under 33 feet in width.

405. **Timber Window Shutters.**—Notwithstanding the provisions of Clause 401, louvred window shutters constructed in timber shall be permitted provided they project not more than 2 inches beyond the street alignment when in the fully open position.

406. **Cat Heads.**—Cat heads or hoists shall not project over any street.

407. **Loading Docks and Platforms.**—Every building of Class III., V., VII., or VIII. Occupancy shall, unless the permission of the Board to the contrary has been obtained, contain accommodation for vehicles delivering goods to or removing goods from such building. Every vehicle dock and loading platform shall be so located that no portion of any vehicle occupying or adjoining same shall project over the street alignment.

408. **Service and Rainwater Pipes.**—Service and rainwater pipes may project 8 inches and rainwater heads may project 12 inches beyond the street alignment above a height of 9 feet from the level of the public footway.

409. **Pavement Lights.**—Pavement lights extending under footways shall be enclosed by solid walls of masonry, concrete, or other approved materials surmounted by a proper stone or concrete kerb and fitted with floor lights not exceeding 4 inches square and not less than $\frac{3}{4}$ -inch thick,

set in metal or concrete frames level with the surface of the footway and secured to the kerbing by being run, with lead, zinc, or other approved material. Prisms set in reinforced concrete may be used with the approval of an officer authorized by the Board. Pavement lights, unless supported on steel joists, shall not exceed 4 feet in length without the approval of an officer authorized by the Board, and no such light shall extend more than 18 inches beyond the street alignment.

410. **Gates, Doors, &c., Abutting on Street.**—No person shall construct or hang any gate, door, window, or shutter in such a manner that any part of such gate, door, window, or shutter shall, when being opened, project over any street or public way at a height less than 9 feet above the level of the pavement. *See also Clause 2021.*

CHAPTER 5.

ROOM SIZES AND HEIGHTS.

- Clause 501. Minimum Number of Rooms.
- Clause 502. Minimum Size of Habitable Room.
- Clause 503. Minimum Height of Rooms in Class I., II., III., IV. or V. Occupancy.
- Clause 504. Minimum Height of Rooms in Shops.
- Clause 505. Minimum Height of Rooms in Warehouses.
- Clause 506. Minimum Height of Rooms in Factories.
- Clause 507. Public Buildings.
- Clause 508. Projections and False Ceilings.

CHAPTER 5.

ROOM SIZES AND HEIGHTS.

501. **Minimum Number of Rooms.**—In every building of Class I., II. or IV. Occupancy every dwelling shall have at least one room having an area of not less than 156 square feet and one of not less than 140 square feet except that—

- (a) where a flat (Class II. Occupancy) contains only two habitable rooms only one room shall be required to have an area of not less than 156 square feet;
- (b) a flat (Class II. Occupancy) may contain only one habitable room provided such room shall have an area of not less than 230 square feet.

502. **Minimum Size of Habitable Room.**—(a) In every building the minimum floor area of every room other than kitchens intended for habitation shall be 100 square feet provided that in a building of Class III. Occupancy the minimum floor area of every such room shall be 100 square feet.

(b) The minimum floor area of kitchens shall be—

- (1) in a combined bed-living room flat—49 square feet.
- (2) in a one bedroom flat or dwelling house—60 square feet.
- (3) in a two bedroom flat or dwelling house—72 square feet.

In all other cases the minimum floor area of the kitchen shall be 80 square feet.

(c) Every habitable room shall be not less than 8 feet wide in its minimum dimension, except a kitchen which may have a minimum width of 7 feet. A kitchenette which is constructed in the form of an annexe to a habitable room and separated therefrom by an unobstructed opening not less than 5 feet wide and 7 feet high shall not be deemed to be a separate habitable room.

503. **Minimum Height of Rooms in Class I., II., III., IV. or V. Occupancy.**—Except where otherwise approved by the Board every habitable room shall have an average of at least 8 ft. 9 in. in height from the floor to the ceiling over its whole area provided that no part of such ceiling is of less height than 7 ft. 6in.

504. Minimum Height of Rooms in Shops.—The height or where the ceiling is pitched or sloping the minimum height from floor to ceiling or if there is no ceiling to the underside of the rafters or underside of floor next above as the case may be in every room hereafter constructed or adapted in a building of Class VI. Occupancy shall not be less than 10 feet provided that—

- (a) in the case of a room not exceeding 450 square feet in area lighted and ventilated in conformity with the requirements of Clause 601, the height may be reduced to 9 feet;
- (b) where the ceiling is pitched or sloping the minimum height in any part shall be not less than 9 feet.

505. Minimum Height of Rooms in Warehouses.—The height or where the ceiling is pitched or sloping the minimum height from floor to ceiling or where there is no ceiling to the underside of the rafters or underside of floor next above as the case may be in every room hereafter constructed or adapted in a building of Class VII. Occupancy shall not be less than 9 feet provided that where the circumstances so warrant the Board may require a greater ceiling height and/or the installation of a system of mechanical ventilation approved by an officer authorized by the Board.

506. Minimum Height of Rooms in Factories.—The height or where the ceiling is pitched or sloping the minimum height from floor to ceiling or where there is no ceiling to the underside of the rafters or underside of floor next above as the case may be in every room hereafter constructed or adapted in a building of Class VIII. Occupancy shall not be less than 9 feet provided that the Board may on the recommendation of an officer authorized by the Board in any particular case fix such greater height and/or the installation of a system of mechanical ventilation approved by an officer authorized by the Board.

507. Public Buildings.—The size and height of rooms, passages and corridors in public assembly and institutional buildings shall conform to the dimensions which the Board in its discretion may decide as applicable to the building under consideration, but in any case the ceiling height of such rooms, passages and corridors shall not be less than 10 feet.

508. Projections and False Ceilings.—Notwithstanding anything contained above, in buildings of Class II., III., IV., V., VI. or VIII. Occupancy—

- (a) beams, service pipes, or ducts may project below the minimum height prescribed, provided that the area in plan of such projections does not exceed 20 per cent. of the floor area of the rooms, with a minimum clear height of 7 ft. 6in.; and
 - (b) false ceilings may be constructed at a height of 7 feet in lavatory blocks, and at a height of 7 ft. 6 in. in corridors, passages and recesses.
-

CHAPTER 6.

NATURAL LIGHT AND VENTILATION.

PART I.—NATURAL LIGHT AND VENTILATION.

- Clause 601. Light and Ventilation.
- Clause 602. Rooms Opening to Enclosed Verandahs.
- Clause 603. Hotel Bars, Kitchens.
- Clause 604. Warehouses.
- Clause 605. Factories.
- Clause 606. Special Requirements for Ventilation of Factories.
- Clause 607. Public Buildings.
- Clause 608. Exception.
- Clause 609. Provision of Airlocks for Water Closets and Urinal Apartments.
- Clause 610. Lighting and Ventilation of Airlocks.
- Clause 611. Lighting and Ventilation of Water Closets, &c.
- Clause 612. Ventilation Shafts.
- Clause 613. Bathrooms.
- Clause 614. Shower Recesses.
- Clause 615. Shower Recess from Bedroom or Bathroom.
- Clause 616. Mechanical Ventilation.
- Clause 617. Discharge of Foul Air.
- Clause 618. Air Disconnection of Water Closets, &c., from Habitable Rooms or Work-rooms.
- Clause 619. Lighting and Ventilation in Exceptional Cases.

PART II.—LIGHT COURTS.

- Clause 620. Light Courts.
- Clause 621. Required Angle of Light.
- Clause 622. Minimum Widths.
- Clause 623. Courts Formed by Streets or Rights of Way.
- Clause 624. Ventilation of Totally Enclosed Light Courts.
- Clause 625. Access to Light Courts.
- Clause 626. Erections in Light Courts.

CHAPTER 6.

NATURAL LIGHT AND VENTILATION.

Part I.—Natural Light and Ventilation.

601. **Light and Ventilation.**—In every building of Class I., II., III., or IV. Occupancy every habitable room and every laundry and kitchen and every room in buildings of Classes V. and VI. Occupancies and such portions of buildings of Class VII. Occupancy as may be used for the display or sale of goods shall—

- (i) have one or more windows opening directly into the external air with superficial area clear of sash frames and free from any obstruction to the light equal to at least 12 square feet or one tenth of the floor area of the room, whichever is the greater, such opening or openings to extend to at least

6 ft. 8 in. above the floor level, and to be so constructed that a portion thereof equal to at least six square feet or one twentieth of the floor area of the room, whichever is the greater, can be opened for ventilation;

- (ii) have no part of any floor more than 25 feet from an unobstructed window opening;
- (iii) have, where buildings are situated north of parallel of latitude 15° unless fitted with an approved system of mechanical air-conditioning, in addition to any light and ventilation afforded by the window or windows described in sub-clause (i), at least one external wall fitted with shutters or louvres of asbestos cement, metal, wood or other approved material for 45 per cent. of the wall area, 75 per cent. of such shutters or louvres to be capable of adjustment. In addition if the permanent ventilation described herein be limited to one wall only, a satisfactory system of trellis, louvres, chain wire or other approved type of permanent ventilating opening to at least one internal partition wall shall be provided as will in the opinion of an officer authorized by the Board facilitate the cross ventilation of the building;
- (iv) where buildings are situated north of parallel of latitude 18° but south of parallel of latitude 15° , have, in addition to any ventilation afforded by the window or windows described in sub-clause (i), at least one external wall fitted with shutters or louvres of asbestos cement, metal, wood or other approved material of 25 per cent. of the wall area, 75 per cent. of such shutters or louvres to be capable of adjustment;
- (v) where buildings are situated south of parallel of latitude 18° , be provided with, in addition to any light and ventilation afforded by the window or windows described in sub-clause (i), permanent ventilation by means of windows, louvres, fanlights, registers, cants, cowls, ducts, airbricks or other approved openings fixed near the ceiling, having an effective airway clear of all obstructions of not less than 12 square inches for every 100 square feet or part thereof of floor area, 50 per cent. of this permanent ventilation to be fixed in one external wall of the room and 50 per cent. in at least one other of the walls in such positions as will provide cross ventilation.

If a fireplace is situated in a room the required area of fixed ventilation may be reduced by one-half.

602. Rooms Opening to Enclosed Verandahs.—Where a room opens to a verandah, either open, or enclosed with shutters or fixed or adjustable louvres, the partition wall between the room and the verandah shall be constructed as an external wall for the purposes of Clause 601. All verandah enclosures shall conform to the requirements of Clause 601.

603. Hotel Bars, Kitchens.—In addition to the natural ventilation specified in Clause 601 hotel bars, kitchens, cafés and restaurants in buildings of Class VI. Occupancy, and kitchens in buildings of Class III., VII. and

IX. Occupancies, shall be provided with registers, cowls, vents or ducts fixed in the ceiling and carried through and above the roof of a total unobstructed area of not less than 24 square inches for each 100 square feet of floor area providing at least eight changes of air per hour in the case of hotel bars, six changes in the case of kitchens and four changes in the case of cafés and restaurants, or alternatively with an approved system of mechanical ventilation.

604. **Warehouses.**—Notwithstanding anything contained in the provisions of Clause 601, every room in a building of Class VII. Occupancy used for bulk storage only may be adequately lighted by roof or ceiling lights having a total superficial area, free from all obstructions to the light, of not less than one twelfth the floor area, and in this case may be ventilated by the provision of registers, vents or cowls fitted in the ceiling and carried through the roof having a total unobstructed area of not less than 12 square inches for each 100 square feet of floor area, or alternatively natural ventilation may be dispensed with where a system of mechanical ventilation is installed capable of providing four changes of air per hour.

605. **Factories.**—(a) Every room in a building of Class VIII. Occupancy shall be provided with natural light and ventilation as specified in Clause 601, except that where any part of the floor is distant from the nearest window more than twice the height of the head of the window from the floor every such part shall be lighted by means of roof lights or by artificial lighting; and

(b) where any work room with windows in one wall or two continuous walls only is more than 30 feet wide, or where any work room is more than 60 feet wide, a mechanical plenum ventilating system, fans, punkahs or other means of inducing air movement shall be provided.

606. **Special Requirements for Ventilation of Factories.**—Notwithstanding the provisions of Clause 605, every factory shall be so ventilated as to render harmless any gases, vapours, dust or impurities generated in course of the manufacturing process, and where an officer authorized by the Board so directs, a fan or a mechanical ventilating system shall be installed to prevent the inhalation by any person working in such factory of such gases, vapours, dust or impurities.

607. **Public Buildings.**—Every public assembly or institutional building of Class IX. Occupancy shall be provided with light and ventilation in accordance with Clause 601, together with such other additional requirements, as the Board in its discretion may consider applicable to the particular building for which a building permit is sought.

608. **Exception.**—The provisions of the foregoing clauses shall not apply to airlocks, water closets, urinal apartments, slop sinks, bathrooms, or shower recesses in any class of building, but such rooms shall be provided with light and ventilation as prescribed in Clauses 609 to 615 hereof.

609. **Provision of Airlocks for Water Closets and Urinal Apartments.**—(a) (i) No water closet or urinal apartment within a building shall open directly into any room used for human habitation or for the manufacture, preparation, or storage of food for human consumption, or as a factory workshop or workplace; and

(ii) In every case where otherwise such closet or urinal apartment would open directly into any such room, an airlock shall be provided having a floor area of not less than 15 square feet and such airlock shall be lighted and ventilated in accordance with Clause 610, provided that where two or more closet pans or urinals are provided an airlock of 20 square feet shall be deemed sufficient.

(b) In a building of Class I. or Class II. Occupancy, a hall, passage, lobby or staircase may be considered as an airlock, provided it has a floor area of not less than 20 square feet and is lighted and ventilated as required by Clause 610.

610. Lighting and Ventilation of Airlocks.—Every airlock shall be provided with a window on an external wall abutting on to a street or on to an open space within the premises and having a width of not less than 4 feet and an area of not less than the following:—

For the first story above floor level of the open space—36 square feet.

For the second story above floor level of the open space—72 square feet.

For all other stories above the floor level of the open space—100 square feet.

such window shall have glazed louvres extending to or as near the level of the ceiling as it is practicable and providing a clear light area of not less than 4 square feet and a clear ventilating area of not less than 2 square feet which may be portion of the window.

611. Lighting and Ventilation of Water Closets, &c.—(a) Every water closet or urinal apartment shall be provided with a window fixed in an external wall conforming to the provisions of Clause 610.

(b) Where a window or windows prescribed in sub-clause (a) provide light to a group of water closets, the water closets so lighted shall be separated by means of a partition or partitions having a clear space of 6 inches between the bottom of each partition and the floor and extending to a height not less than 6 feet above the floor, but in no case shall any such partition extend nearer than 12 inches to the ceiling.

612. Ventilating Shafts.—No other room shall open on to the same shaft as water closets, urinal apartments, airlocks and bathrooms.

613. Bathrooms.—(a) Every bathroom shall be provided with a window placed in an external wall conforming to—

(i) the requirements of Clause 610, such window having a superficial area clear of sash frames, and free from any obstruction to the light equal to at least 6 square feet or one-tenth of the floor area of the room (whichever is the greater) and so constructed that a portion equal to at least one-twentieth of the floor area can be opened; and

(ii) provided with a vent or vents in or near the ceiling and carried as directly to the open air as it is possible, having an effective airway of not less than 12 square inches or 1 square inch for every 4 square feet of floor area, whichever is the greater.

(b) Glazed louvres may be used in lieu of windows and ventilators required by this clause subject to their providing a clear light area of not less than 6 square feet or one-tenth of the floor area (whichever is the greater) and a clear ventilating area of not less than 27 square inches.

614. **Shower Recesses.**—Shower recesses shall be ventilated as prescribed for bathrooms in Clause 613, except that an effective airway of not less than 12 square inches shall be provided.

615. **Shower Recess from Bedroom or Bathroom.**—Where a shower recess opens from a bedroom or a bathroom, the ventilation prescribed in Clause 614 shall, if not provided directly to the recess, be provided in the bedroom or bathroom.

616. **Mechanical Ventilation.**—(a) Where any system of mechanical ventilation is installed in a building, the owner or his representative shall on completion and at any other reasonable times allow an officer authorized by the Board to inspect the system and shall co-operate with him in operating the plant so that he may carry out any tests he considers desirable.

(b) The owner or his representative shall take all necessary steps to ensure the efficient operation of the system at all times in conformity with this Manual.

617. **Discharge of Foul Air.**—Foul or vitiated air shall not be discharged from any mechanical exhaust ventilating system to any place where it may constitute a nuisance.

618. **Air Disconnection of Water Closets, &c., from Habitable Rooms or Work-rooms.**—Bathrooms, water closets, urinals or other areas where air may be vitiated shall not be connected by means of vents in dividing walls with kitchens, habitable rooms or rooms where persons are employed, and any mechanical ventilating or air-conditioning system shall be so arranged as to prevent the flow of air through the system between such rooms or areas.

619. **Lighting and Ventilation in Exceptional Cases.**—Where the provisions of this chapter are applicable and where extraordinary circumstances would render their application unreasonable, an officer authorized by the Board may in any such case, notwithstanding anything elsewhere contained in this chapter, determine the amount and type of light and ventilation to be provided. (For lighting and Ventilation of Exits *see* Clause 1425.)

NATURAL LIGHT AND VENTILATION.

Part II.—Light Courts.

620. **Light Courts.**—In this part unless inconsistent with the context or subject-matter—

“Light court” means a court or unoccupied space wholly open at the top constructed or adapted for admitting light to a building and includes such parts of light courts of an adjoining building abutting on the common boundary of such buildings as will, when combined, form a common court provided that the reciprocal light easements thereover have been permanently created by endorsement on the titles of the land on which such buildings are erected and includes also a street, way or lane over which such building is permanently entitled to access of light.

“Totally enclosed court” means a light court enclosed on four sides by the walls of a building. Any boundary of the site on which an adjoining owner has the right to build shall for the purpose of this part of the Manual be considered a wall of the building.

Height of a light court with reference to any wall of a light court means the vertical distance from the lowest part of any window or windows in such a wall which permits light to be admitted through such window or windows into the room or floor lighted thereby.

Where the light court bottom is the roof of any story having a skylight required for the provision of light or ventilation to such story, the height shall be measured from the lowest point of the ceiling surrounding such skylight or if there is no ceiling from the lowest part of such skylight.

“Width of a light court” with reference to any wall of a light court means the shortest horizontal distance from the face of such wall at the level of the lowest window to the vertical plane of the face of the wall or parapet on the opposite boundary of the light court or, if none, to the vertical plane of the opposite boundary of the light court.

“Angle of light” with reference to any window in a wall of a light court means the angle formed by the vertical plane of the face of such a wall and a line drawn from a point in such vertical plane at the level of the lowest part of such window bisecting diagonally a rectangle having for two of its sides the height and the width of such light court.

621. Required Angle of Light.—Every window abutting on a light court other than windows lighting corridors, lavatories and sanitary conveniences shall have an angle of light not less than the angle of light resultant from the ratio of height to width of light courts in Table 621 hereunder applicable to such window and shall receive at such an angle of light unobstructed light from the sky, provided that where the opposite boundary of the light court on which such window abuts is also the boundary of an adjoining property such window need not receive such unobstructed light but shall be deemed to have the required angle of light if a window at the same light level erected on such opposite boundary of the light court would have the angle of light required under Table 621.

TABLE 621.

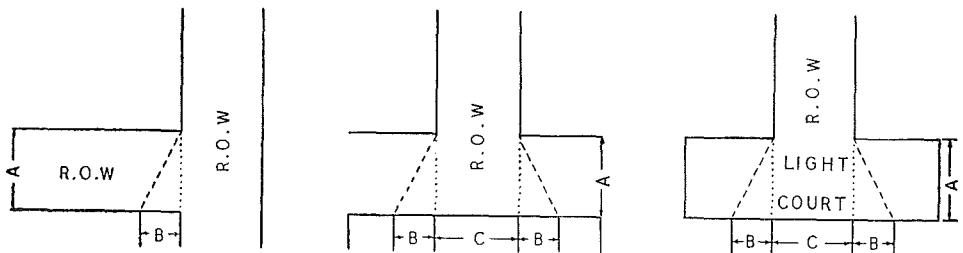
Class of Building.	Angle of Light.
Buildings of Class I., II., also buildings of Class III. erected in residential and residential flat areas	These buildings shall comply with the provisions of Chapter 3
Buildings of Class III., other than those erected in residential and residential flat areas, also buildings of Class IV., V. and VIII. occupancy	3 to 1
Buildings of Class VI. and VII.	5 to 1

The provisions of Table 621 shall not apply to windows of buildings of Class III. other than those erected in residential and residential flat areas, also buildings of Class V., VI., VII. and VIII. which are lighted from a court with an open side on to a street or unoccupied space along the entire length of the side or rear of the building having an angle of light of 2 to 1 provided further that the width of such court is not less than one half of its depth measured from the face of the building.

622. Minimum Widths.—The minimum width of any light court shall comply with the following:—

- (a) For all buildings of more than one story in height the minimum width shall not be less than 10 feet.
- (b) The minimum width of all light courts having required windows in one or more walls shall be increased in width and length above the minimum width of 10 feet for the full height if necessary to comply with the provisions of Table 621.
- (c) The width of any light court lighting only required lavatories, sanitary conveniences, &c. and not containing required windows shall not be less than one-sixth of the height and in no case less than 10 feet.
- (d) Ventilating ducts serving factories and sanitary conveniences, &c. which are mechanically ventilated or air-conditioned shall comply with the requirements of an officer authorized by the Board.

623. Courts Formed by Streets or Rights-of-way.—In cases where a street or right-of-way being a light court abuts wholly or partly on a building and is intersected by or connected with another street or the required angles thereto, an officer authorized by the Board may permit windows within the wall of the building abutting on the light court and located within a distance of half the width of such court on one or both sides of the intersecting street or right-of-way.



Illustrating Clause 623.

Distance "B" = $\frac{1}{2}$ A

Windows in space "B" may be treated as windows in space "C".

624. Ventilation of Totally Enclosed Light Courts.—Where a totally enclosed court, wholly or in part open at the top and constructed or used for admitting light and air to a building of Class I., II., III. or V. Occupancy, is constructed in connexion with such building and the court from the

eaves or top of the parapet to the ceiling at the ground story exceeds the length or breadth of such court, then ventilation shall be provided by means of—

- (i) a system of mechanical ventilation capable of giving six changes of air per hour and designed to introduce plenum air from a clean source and to distribute the air from the bottom of the light court in such a manner as to ensure even distribution over all sections of the light well which are pierced by windows, louvres or vents; or
- (ii) a flue constructed between the lower end of the court and the outer air having a thoroughway, the least sectional area of which shall measure not less than 5 square feet or one-twentieth of the average horizontal area of such court, whichever is the greater, but in no case shall the maximum sectional area of the ventilating flue be less than 18 inches across in any direction nor be constructed in such a manner that it cannot be cleaned out.

Provided that when such court is situated upon an allotment boundary and when at the time of construction of such court the walls of buildings on adjoining allotments are not such as to make the provisions of this clause applicable either the flue required by sub-clause (ii) hereof shall be provided during construction of such court or approved provision shall be made for the future installation at such time as the court becomes completely enclosed of the system of mechanical ventilation required by sub-clause (i) hereof. The owner of the building in connexion with which such light court is constructed shall, if and when called on by an officer authorized by the Board, complete the installation of such system of mechanical ventilation. Provided further that such ventilation of totally enclosed light courts shall not be required for light courts of two stories or less in height.

625. Access to Light Courts.—In all closed courts there shall be means of access at the lowest level.

626. Erections in Light Courts.—Vent ducts, flues, service pipes and erections of like nature shall be permitted in light courts provided such erections are of fire resisting materials, but where their combined area exceeds 10 per cent. of the area of such light court the area of the light court shall be increased by the equivalent of such excess percentage. The area of such erections for the purposes of this clause shall be their horizontal projection between any two floors of a building.

CHAPTER 7.

MATERIALS AND WORKING STRESSES.

PART I.—MATERIALS.

- Clause 701. Requirements for Materials.
- Clause 702. Old and Second-hand Materials.
- Clause 703. Bricks.
- Clause 704. Cast Stone.
- Clause 705. Cement.
- Clause 706. Lime.
- Clause 707. Sand and Fine Aggregate.
- Clause 708. Coarse Aggregate for Concrete.
- Clause 709. Water.
- Clause 710. Mortar.
- Clause 711. Concrete.
- Clause 712. Restrictions on Grade "D" Concrete.
- Clause 713. Ready Mixed Concrete.
- Clause 714. Reinforced Concrete.
- Clause 715. Steel.
- Clause 716. Electrodes.
- Clause 717. Cast Iron.
- Clause 718. Timber.
- Clause 719. Sand-lime Bricks.
- Clause 720. Concrete Blocks.
- Clause 721. Terra Cotta Blocks.
- Clause 722. Galvanized Sheets.
- Clause 723. Roofing Tiles.
- Clause 724. Asbestos Cement.

PART 2.—PERMISSIBLE WORKING STRESSES.

- Clause 725. Permissible Working Stresses.
- Clause 726. Tests.

CHAPTER 7.

MATERIALS AND WORKING STRESSES.

Part I.—Materials.

701. **Requirements for Materials.**—Materials used in the construction of any building shall conform to the requirements for such materials set out in this Chapter.

702. **Old and Second-hand Materials.**—No old or second-hand timber, bricks, iron, steel or other materials shall be used in the construction of any building unless the same has been first inspected and permission for its use granted by an officer authorized by the Board.

703. **Bricks.**—All bricks used in any building shall be wholly sound hard and well burnt, and in conformity with the S.A.A. Specification for Building Bricks No. A.21.

704. **Cast Stone** units for structural purposes shall comply with the S.A.A. Specification for Cast Stone with Portland Cement Base No. A.22.

705. Cement.—(a) Cement shall comply with the S.A.A. Specification for Portland Cement No. A.2.

(b) For the purpose of this Manual the weight per cubic foot of cement shall be accepted as 94 lb., the contents of the commercial bag of cement (weighing one twenty-fourth of 1 ton).

706. Lime.—The lime used for lime mortar shall be either—

- (a) Freshly burnt quick lime in conformity with the tentative S.A.A. Specification for Quicklime No. A.3, such quicklime being properly slaked before being mixed with the sand.
- (b) Hydrated lime in the form of a fine white powder and in conformity with the tentative S.A.A. Specification for Hydrated Lime No. A.4. For the purpose of this Manual the weight per cubic foot of dry powdered hydrated lime shall be 40 lb.

707. Sand and Fine Aggregate.—(a) Fine aggregate for concrete shall consist of clean, hard, strong, durable uncoated grains, free from injurious substances, and conforming to the requirements for fine aggregate set out in the S.A.A. Code for Concrete in Building No. C.A.2.

(b) Sand for mortar for brickwork, masonry or plastering shall conform to the requirements for fine aggregate set out in the S.A.A. Code for Concrete in Building No. C.A.2, except the requirements for grading set out therein.

(c) For the purpose of this Manual the weight per cubic foot of sand or fine aggregate shall be taken as 90 lb. except where actual weights per cubic foot of dry sand or aggregate can be ascertained by tests of the material being used in the construction work, when the actual weights so ascertained shall be used.

708. Coarse Aggregate for Concrete.—(a) Coarse aggregate for Grades "A", "B" and "C" concrete as set out in Table 711 (1) shall conform to the requirements of the S.A.A. Code for Concrete in Building No. C.A.2.

(b) Coarse aggregate for Grade D Concrete shall—

- (i) consist of stone, gravel, or other approved material of similar characteristics of a maximum gauge of 3 inches, having clean, strong, durable particles and be free from injurious amounts of deleterious matter, honeycomb, weathered or disintegrated stone, flaky or elongated pieces and dust and, if considered necessary by an officer authorized by the Board, coarse aggregate shall be washed before use;
- (ii) be as far as practicable evenly graded from large to small pieces, but where satisfactory grading cannot be obtained extra cement shall be added to enable the requisite compressive strength to be obtained;
- (iii) for the purpose of this Manual be deemed to weigh 90 lb. per cubic foot, except where actual weights per cubic foot of the aggregate can be ascertained by tests of the material being used in the construction work, when the actual weights so ascertained shall be used.

For unreinforced concrete members having a minimum dimension of 18 inches, pieces of coarse aggregate larger than 3-in. gauge but not larger

than one-fourth the minimum dimension of the concrete member, and otherwise conforming to the requirements of paragraph (i) hereof may be hand placed in the concrete provided that the minimum thickness of concrete between pieces, or between any piece and the face of the concrete shall be not less than 50 per cent. greater than the maximum size of coarse aggregate described in paragraph (i) hereof.

709. Water.—Water used for mixing concrete and mortars shall conform to the requirements for such set out in the S.A.A. Code for Concrete in Building No. C.A.2.

710. Mortar: (a) Lime Mortar shall be composed in the proportion of three volumes of sand to one volume of lime thoroughly mixed prior to use, provided that a mixture of seven volumes of sand and one volume of cement, to which up to an amount not exceeding 10 per cent. of the volume of the sand and cement hydrated lime may be added, shall be permitted when the use of lime mortar is permitted by this Manual.

(b) Composition Mortar shall be composed of a mixture of cement with hydrated lime conforming to the requirements of sub-clause (b) of Clause 706 and sand. Not less than one part of cement shall be used to every two parts of lime, and the mortar shall contain not less than one part of cement-lime mixture to every three parts sand. Only as much water as will render the mixture plastic shall be used.

(c) Cement Mortar shall be composed of a mixture in the proportions of:—

- (i) one cubic foot of cement;
- (ii) not more than 4 cubic feet of dry sand; and
- (iii) as much water as will render the mixture plastic.

Where not more than 20 per cent. by volume conforming to the requirements of this sub-clause is replaced by hydrated lime, such mortar may, for the purposes of this Manual, be regarded as cement mortar.

(d) Before water is added the other component parts of mortar containing cement shall be accurately and separately measured and thoroughly mixed together. Mortar containing cement shall be used before initial setting has commenced, and without retempering by the addition of further cement and/or water.

711. Concrete.—Concrete shall—

- (a) consist of cement, fine aggregate, coarse aggregate and water conforming to the requirements for such materials set out in Clauses 705, 707, 708, 709 of this Manual;
- (b) if proportioned by volume, be as specified for the various grades in Table 711 (1), the method of measuring being as set out in S.A.A. Code for Concrete in Building No. C.A.2, provided that additional materials may be used with the approval of an officer authorized by the Board to improve workability and that the use of materials in the proportions specified shall not detract from the necessity of compliance with sub-clause (d) hereof; or if proportioned by weight, the quantities of fine and coarse aggregates shall be equivalent to the volumes specified in Table 711 (1);

- (c) be of quaking consistency but not sloppy, the slumps when tested in accordance with the Australian Standard Method for Determination of Consistency of Cement Concrete No. A.8 being not in excess of those set out in Table 711 (2); and
- (d) have when tested in accordance with Australian Standard Method for Making Compression Tests on Concrete No. A.27 appended to S.A.A. Code No. C.A.2 compressive strengths at 28 days after mixing not less than those set out in Table 711 (1) for the appropriate grades.

TABLE 711 (1).
Concrete Proportions.

Grade of Concrete.	Cement.	Fine Aggregate.	Coarse Aggregate.	Required Compressive Strength in lbs. per square inch.	
				Concrete.	* Special Concrete.
	lb.	cub. ft.	cub. ft.		
A Grade ..	94	1	2	3,000	3,750
B Grade ..	94	1½	3	2,600	3,250
C Grade ..	94	22	4	2,200	2,750
D Grade ..	94	2½	5	1,700	..

* For increased stresses in Special Concrete see Clause 1804.

TABLE 711 (2).

Concrete.	Maximum Slump in inches.
In sections not thicker than 6 inches requiring forms on both sides ..	6
In columns, heavy sections, beams and slabs	5
In footings	4
If consolidated by vibration method	2

NOTE: To allow for vibration in the characteristics of coarse and fine aggregates the proportions of coarse to fine aggregates given in Table 711 (1) may be varied as deemed necessary by a Building Inspector or officer authorized thereto by the Board in order to obtain satisfactory workability with a minimum water-cement ratio and in any case without segregation of the ingredients, provided that the total number of cubic feet of fine and coarse aggregates per 94 lb. of cement shall not be increased and provided also that neither the volume of coarse aggregate nor the volume of fine aggregate shall be increased or decreased by more than one-half cu. ft. per 94 lb. of cement in the case of Grade A concrete; by more than three-quarters cu. ft. in the case of Grade B concrete, and by more than 1 cu. ft. in the case of Grade C concrete, that is:—

1 : 1 : 2 concrete may contain any mix between 1 : ½ : 2½ and
1 : 1½ : 1½

1 : 1½ : 3 concrete may contain any mix between 1 : ¾ : 3¾ and
1 : 2¼ : 2¼

1 : 2 : 4 concrete may contain any mix between 1 : 1 : 5 and
1 : 3 : 3

Satisfactory workability may also be obtained by increasing the proportion of cement in the mix.

Allowance shall be made for the bulking of fine aggregate in accordance with Australian Standard A.26 Field Methods of Determining the necessary adjustment for the bulking of fine aggregate, appended to S.A.A. Code for Concrete in Building No. C.A.2.

712. **Restrictions on Grade "D" Concrete.**—Grade "D" Concrete shall not be used except for footings in buildings of Types 3, 4 and 5 Construction, and in special cases approved by the Board or any person authorized by the Board.

713. **Ready Mixed Concrete.**—Where concrete for use in the construction of any building is not mixed on the job, such concrete shall conform to the S.A.A. Specification for Ready Mixed Concrete No. (E) A. 502.

714. **Reinforced Concrete.**—Reinforced concrete shall—

- (a) consist of concrete as prescribed in Clause 711 of this Building Manual and steel or other approved metal reinforcement combined; and
- (b) conform to the requirements of Chapter 18.

715. **Steel.**—(a) Mild steel reinforcement for reinforced concrete and structural steel for structural members shall conform to the requirements of the S.A.A. Specification No. A.1 except where prescribed to the contrary in this Manual.

(b) All structural steel work in any building shall be designed, fabricated and erected as prescribed in Chapter 18.

(c) **Rivets.**—Rivets shall—

- (i) as to materials conform to the requirements of the S.A.A. Specification for Structural Steel No. A.1;
- (ii) as to form and dimensions conform to the requirements of the S.A.A. Specification for Dimensions of Rivets, No. A.34.

(d) **Bolts and Nuts.**—Bolts and nuts shall comply with the following:—

- (i) All bright bolts and nuts shall conform to the requirements of the S.A.A. Specification for B.S.W. Bright Hexagon Bolts, Set Screws and Nuts No. B.48.
- (ii) All black bolts and nuts shall conform to the requirements of the British Standard Specification for Black Bolts and Nuts No. 28.

(e) **Castings.**—Steel castings shall conform to the requirements of the S.A.A. Specification for Steel Castings B.27.

716. **Electrodes.**—Electrodes shall conform to the requirements of the S.A.A. Specification No. A.18 "Electrodes for Metallic Arc Welding in Mild Steel Construction."

717. **Cast Iron.**—All cast iron shall be made of clean, tough, grey iron, and shall conform to the requirements of the S.A.A. Specification for Grey Iron Castings No. B.26.

718. **Timber.**—All structural timber used in any building shall conform to the requirements and standards set down in the S.A.A. Specification Australian Standard Grading Rules for Sawn and Hewn Structural Timbers No. (e) O.54.

719. **Sand-lime Bricks.**—Sand-lime bricks shall conform to the British Standard Specification for Sand-lime Bricks No. 187. When used in external walls they shall conform to the requirements for Building Bricks, Class A, and when used in internal walls or partitions, they shall conform to the requirements for building Bricks, Class B.

720. Concrete Blocks.—Concrete blocks may be either hollow or solid, and shall conform to the following requirements:—

- (a) Such blocks shall be made of concrete materials conforming to the requirements of Clause 711, except that burnt clay or shale, blast furnace slag, cinders or other approved material may be used as an aggregate. When cinders are used as an aggregate, they shall be weathered before use, and the combustible content shall not exceed 20 per cent. by weight of the dry cinders, and no units shall contain more than 1 per cent. by weight of sulphur.
- (b) Solid blocks shall have an ultimate crushing strength of an age of 28 days as follows:—
 - Class A—1,500 lb. per square inch of gross area.
 - Class B—1,000 lb. per square inch of gross area.
- (c) Hollow blocks shall have a minimum crushing strength of 700 lb. per square inch of gross sectional area when tested 28 days after manufacture in position as used in the wall.
- (d) When used in positions exposed to the weather or to moisture, concrete blocks shall have a maximum absorption of 10 per cent. of the weight of the dry block, when immersed in cold water for 24 hours; or shall be protected by cement or composition mortar not less than $\frac{1}{2}$ inch thick.
- (e) No block used in any load bearing construction shall be less than 4 inches thick.
- (f) Notwithstanding anything contained above, hollow concrete blocks manufactured in a portable block-making machine on the job or otherwise, or manufactured other than in a factory properly equipped for regular testing, shall be made of concrete composed of not less than one volume of cement and six volumes of approved aggregate, and shall be not less than 6 inches thick. The outer walls or shell of each block shall be not less than $1\frac{1}{2}$ inches thick, and the cross ties and webs not less than $1\frac{1}{4}$ inches thick.

721. Terra Cotta Blocks.—(a) Terra cotta blocks shall be hard and well burnt, and the outer walls or shell and the cross ties or webs shall be not less than $\frac{3}{4}$ inch thick.

(b) Blocks used in bearing walls shall be not less than 4 inches thick.

(c) Blocks used in positions exposed to the weather or to moisture shall be protected by cement or composition mortar not less than $\frac{1}{2}$ inch thick.

722. Galvanized Sheets.—Galvanized (zinc coated) sheets shall conform to the requirements set out for the appropriate class of sheets in S.A.A. Specification for Zinc Coated (Galvanized) Sheets No. A.20.

723. Roofing Tiles.—(a) Cement concrete roofing tiles shall conform to the requirements of the S.A.A. Specification for Cement Concrete Roofing Tiles, No. A.14.

(b) Terra cotta roofing tiles shall conform to the requirements of the S.A.A. Specification for Terra Cotta Roofing Tiles No. A.13.

724. Asbestos Cement.—Asbestos cement slabs, unreinforced flat sheets, and corrugated sheets shall conform to the British Standard Specification therefor, No. 690.

MATERIALS AND WORKING STRESSES.

Part 2.—Permissible Working Stresses.

725. **Permissible Working Stresses.**—Except where prescribed to the contrary in this Manual, the maximum stresses computed as prescribed by Clause 902 shall not exceed in the case of—

- (a) Structural steel members—the values prescribed in Chapter 18.
- (b) Steel or iron castings—the values prescribed in Chapter 18.
- (c) Reinforced steel—the values prescribed in Chapter 18.
- (d) Brickwork—the values set out for the appropriate conditions in Appendix “F” to S.A.A. Code for Structural Steel in Building No. C.A.1 provided that the mortar shall be as specified in Clause 710 (a), (b) or (c) and that the maximum stresses in the case of brickwork in composition mortar shall be two-thirds of the maximum stress on brick-work in cement mortar.
- (e) Reinforced brick masonry—the values set out in Part 11 of Chapter 18.
- (f) Stonework—the values set out for the appropriate conditions in Appendix “F”, to the S.A.A. Code for Structural Steel in Building No. C.A.1.
- (g) Sand-lime bricks, when laid in cement or composition mortar—the values as follows:—
 - Sand-lime bricks, Class A—175 lb. per square inch in compression; and
 - Sand-lime bricks, Class B—100 lb. per square inch in compression.
- (h) Concrete blocks, when laid in cement or composition mortar—the values as follows:—
 - Solid blocks, Class A—175 lb. per square inch in compression;
 - Solid blocks, Class B—100 lb. per square inch in compression; and
 - Hollow blocks—70 lb. per square inch of gross area.
- (i) Terra cotta blocks, when laid in cement or composition mortar—70 lb. per square inch of gross area.
- (j) Timber—the values set out in the Handbook of Structural Timber Design (Second Edition) being Technical Paper No. 32 issued by the Division of Forest Products of the Council for Scientific and Industrial Research.
- (k) Concrete, Grades A, B, C and D—the values set out in Chapter 18.
- (l) Foundations: Loading on foundations by footings—the values set out in Clause 1301.

In the case of materials for which the allowable unit working stress is not prescribed in this Manual, the allowable unit working stress shall be determined by the Board or an officer authorized by the Board.

726. **Tests.**—(a) The builder shall, when required by the Board or by an officer authorized thereto by the Board, cause to be made such of the tests relating to materials set out in the various Australian Standard Specifications and Codes referred to in this Chapter as the Board or officer authorized thereto by the Board may direct. When no applicable Australian Standard Specification or Code exists, the builder shall when so required cause to be made such tests as may be directed. These tests shall be carried out in the presence of an officer authorized by the Board.

(b) Frequent compression tests shall be made during the progress of the works of specimens of the concrete taken from the place where it is being finally deposited in the work to enable an officer authorized by the Board to ascertain if the concrete conforms to the requirements of this Manual.

(c) The work may be subjected by the officer to approved analytical tests made from samples taken from placed works.

CHAPTER 8.

FIRE RESISTING MATERIALS.

- Clause 801. General.
 - Clause 802. Requirements for Materials.
 - Clause 803. Protection of Columns.
 - Clause 804. Fire Rating of Materials.
 - Clause 805. Materials for Stairs.
 - Clause 806. Fire Retardant Materials.
 - Clause 807. Fire Doors.
 - Clause 808. Fire Windows.
 - Clause 809. Fire Shutters.
-

CHAPTER 8.

FIRE RESISTING MATERIALS.

801. **General:** (a) Materials of construction and any combination of such materials shall be classified for fire-resistive purposes in terms of hours of resistance to destruction when subjected to the Standard Fire Test as set out in S.A.A. Specification No. A. 30.

(b) The materials and combination of materials set out in this Chapter shall be assumed to have the fire-resistance ratings here given. Other materials or combination of materials may be used in place thereof provided that such materials or combination of materials have, when subjected to the Standard Fire Test, a fire resistance rating at least equal to that required by this Manual for the part of the structure in which it is proposed to use such materials or combination of materials, and if, in the opinion of an officer authorized by the Board, such materials or combination of materials are otherwise suitable for the purpose.

(c) The thickness and sizes of materials and combination of materials given in this Chapter are the minimum thicknesses and sizes which will be accepted for the purpose of fire resistance, but all such materials and methods of construction must in addition comply in all respects with all other provisions of this Building Manual.

802. **Requirements for Materials.**—Materials to be given the fire resistance ratings set out in this Chapter, shall comply with the relevant requirements of Chapter 7 hereof and with the requirements set down hereunder:—

- (a) Bricks, terra cotta blocks, and concrete blocks shall be laid in cement or composition mortar, except that lime mortar may be used in the case of buildings of one story only.
- (b) Gypsum blocks shall be laid in gypsum or lime mortar.
- (c) Expanded metal as a base of reinforcement for plastering shall have not less than two and one half meshes per inch.

- (d) Except where the use of gypsum plaster is permitted, plaster shall consist of cement mortar not less than $\frac{1}{2}$ inch thick, which may be finished in gypsum plaster or lime putty. Gypsum plaster shall consist of not more than two and one half parts of sand to one part of gypsum. In all cases where plastering is required, the thickness of plaster is additional to the thickness of material specified in Clause 804.
- (e) Precast concrete for steel encasement shall be in large units with metal reinforcement equivalent to that specified for concrete encasement of steel work in S.A.A. Code for Concrete in Building, No. C. A. 2, the method of jointing such units to be approved by an officer authorized thereto by the Board. (See also Clause 1808.)

803. Protection of Columns.—In factories, garages, warehouses, and other buildings in which the fire protective covering of steel or iron columns may be injured by the movement of vehicles, materials or equipment, an officer authorized by the Board may require such covering to be protected by metal or other suitable material.

804. Fire Rating of Materials.—The fire resistance rating of materials or combination of materials when used for the purpose described shall be assumed to be as set out hereunder:—

(a) Walls.—External and internal bearing walls, fire walls and party walls—

(i) Four hours—

- 9-in. solid brick or sand lime brick.
- 11-in. cavity walls of brick or sand lime brick, plastered both sides.
- 9-in. ashlar masonry.
- 8-in. solid concrete blocks, Grade A or B.
- 10-in. cavity walls of solid concrete blocks, Grade A or B, plastered both sides.
- 8-in. concrete not reinforced.
- 6-in. reinforced concrete.
- 5-in. reinforced concrete plastered both sides.

(ii) Three hours—

- 11-in. cavity walls of brick or sand lime brick, plastered one side.
- 6-in. solid concrete blocks, Grade A or B.
- 6-in. concrete, not reinforced.
- 5-in. reinforced concrete.
- 4-in. reinforced concrete, plastered both sides.
- Any wall specified in Clause 804 (a) (i).

(b) Walls.—Exterior panel walls, internal non-bearing walls and partitions, lift, stair and shaft enclosures—

(i) Three hours—

- 11-in. cavity walls of brick or sand lime brick.

10-in. cavity walls of solid concrete blocks, Grade A or B.

6-in. terra cotta or hollow concrete blocks, plastered one side.

5-in. concrete not reinforced.

4-in. reinforced concrete.

Any walls specified in Clause 804 (a).

(ii) Two hours—

4½-in. brick or sand lime brick, plastered both sides.

4-in. solid concrete blocks, Grade A or B, plastered both sides.

4-in. concrete not reinforced.

3-in. reinforced concrete.

Any wall specified in Clause 804 (a) or 804 (b) (i).

(iii) One hour—

4½-in. brick or sand lime brick.

4-in. solid concrete blocks, Grade A or B.

3-in. solid concrete blocks, Grade A or B, plastered one side.

3-in. hollow concrete blocks or terra cotta, plastered both sides.

3-in. gypsum blocks plastered both sides with gypsum plaster.

2½-in. solid Portland cement plaster or gypsum plaster, on expanded metal or wire lath on incombustible studding.

Any wall specified in Clause 804 (a) or 804 (b) (i) or (ii).

(c) Floors, roofs and ceilings—

(i) Three hours—

4 inches of reinforced concrete having not less than ¾-in. cover to reinforcement.

4 inches of precast reinforced concrete with concrete laid in situ above, the thickness given being exclusive of cavities and no portion of any concrete or precast concrete being less than 1 inch thick.

7 inches minimum of composite construction consisting of a top slab not less than 2 inches thick on concrete ribs and fillers of hollow gypsum concrete, or terra cotta blocks, the thickness of the top, bottom and sides of each being not less than ¾-in. and with not less than ¾-in. cover to reinforcement. *See also Clause 1812.*

(ii) One hour—

Wood joist construction fire-stopped by filling all openings around pipes or flues with incombustible material, and covered with double floor board, having a total thickness of not less than 1½ inch, and with ceiling of at least ¾-in. plaster or gypsum plaster on expanded metal or wire lath. The weight of expanded metal or wire lath shall not be less than 2.2 lb. per square yard.

(d) Steel Columns.—Thicknesses given below are the minimum thicknesses measured from the face of the steel exclusive of rivet heads, but in the case of columns of buildings of Class IV., and Class VII. Occupancy, such thicknesses shall be increased by $\frac{1}{2}$ -in. In columns required to have four hour or three hour ratings re-entrant or other accessible spaces behind the specified outer protection shall be filled with concrete or with the material of the outer protection. Where the edges of the flanges of the columns project beyond the webs, the thicknesses specified may be reduced by not more than $\frac{1}{4}$ inch immediately opposite such edges. (See also Clause 1808.)

(i) Four hours—

2½-in. concrete or precast concrete.

2-in. concrete, plastered.

4½-in. brick.

4-in. solid concrete blocks, Grade A or B.

4-in. terra cotta, plastered.

4-in. hollow concrete blocks, plastered.

(ii) Three hours—

2-in. concrete or precast concrete.

1½-in. precast concrete, plastered.

3-in. brick.

3-in. solid concrete blocks, Grade A or B.

3-in. terra cotta, plastered.

3-in. hollow concrete blocks, plastered.

Any material specified under Clause 804 (d) (i).

(iii) Two hours—

1½-in. precast concrete.

1-in. precast concrete, plastered.

2-in. solid concrete blocks, Grade A or B.

2-in. terra cotta, plastered.

2-in. hollow concrete blocks, plastered.

Any material specified under Clause 804 (d) (i), or (ii).

(e) Combination Columns.—The thickness specified below is the minimum thickness of concrete cover over the face of the main steel members, but in the case of columns in buildings of Class VI. and Class VII. Occupancy, such thickness shall be increased by $\frac{1}{2}$ -in.

(i) Four hours—

2-in. concrete.

(ii) Three hours—

As for four hours.

(iii) Two hours—

As for four hours.

(f) Reinforced Concrete and Composite Columns.—The thicknesses specified below are the minimum concrete cover over the main reinforcements. All structural steel must be covered at least 3 inches in buildings of Class VI. and Class VII. Occupancy and 2½ inches in all other buildings.

(i) Four hours—

2-in. concrete.

1½-in. concrete, plastered.

- (ii) Three hours—
 - 1½-in. concrete.
 - 1-in. concrete, plastered.
 - (iii) Two hours—
 - 1-in. concrete.
- (g) Steel Beams, Girders and Trusses.—Thicknesses given below are the minimum thicknesses measured from the outer face of the steel. Re-entrant angles are to be filled. (See also Clause 1808.)
- (i) Four hours—
 - 2-in. concrete.
 - 1½-in. concrete, plastered.
 - (ii) Three hours—
 - 1½-in. concrete.
 - 1-in. concrete, plastered.
 - (iii) Two hours—
 - 1-in. concrete.
- (h) Reinforced Concrete Beams, Girders and Trusses.—Thicknesses specified below are the minimum concrete cover over main reinforcement, including stirrups over ½ inch diameter:—
- (i) Four hours—
 - 1½-in. concrete.
 - (ii) Three hours—
 - As for four hours.
 - (iii) Two hours—
 - 1-in. concrete.
- (i) Lintels.—Lintels shall have, or shall be so protected as to have, the same degree of resistance to fire as the walls in which they occur, provided that steel or iron angles, plates, or bars carrying the outer portions of external walls and supported from structural beams or lintels or spanning over openings in walls of Class I. or Class II. Occupancy shall not be required to have a fire resistance rating.
- (j) Base Structures.—A base structure shall have a fire rating at least equal to that of the portion of the building which it supports.

805. **Materials for Stairs.**—(a) Stairs.—Except as provided in Clause 1910 (a) the following will be permitted for stairs:—

- (i) Reinforced concrete.
- (ii) Iron or steel not less than ¼ inch in thickness.
- (iii) Jarrah, red gum, or other timber having an average density at 12 per cent. moisture content of more than 50 lb. per cubic foot and having a finished thickness of not less than 1½ inch.

(b) Ceilings and Soffits of Staircases.—The following materials will be permitted for ceilings or soffits of staircases:—

- (i) Plaster.
- (ii) Approved plaster or asbestos sheeting.
- (iii) Tongued and grooved jarrah or other hard timber having a finished thickness of not less than ¾ inch.

See also Clauses 2004 and 2010.

806. Fire Retardant Materials.—The following materials shall be classified as fire retardant materials:—

(a) For Roof Coverings—

- (i) Sheet metal not less than 26 B.W.G. in thickness.
- (ii) Slates.
- (iii) Terra cotta or cement roofing tiles.
- (iv) Asbestos cement sheets, not less than $\frac{3}{16}$ inch in thickness.
- (v) Built-up roofing, consisting of successive layers of roofing felt, the final layer consisting of asbestos felt impregnated with tar or asphalt, or other roofing felt impregnated with tar or asphalt and covered with gravel or granulated slate or stone.
- (vi) Concrete, granolithic, terazzo, cement mortar, and other similar incombustible materials.

(b) For Internal Construction—

- (i) Iron, steel, or copper sheets, not less than 26 B.W.G. in thickness.
- (ii) Asbestos cement sheets having a thickness of not less than $\frac{5}{8}$ inches.
- (iii) Any material specified under sub-clause (a) (vi) of this clause.

807. Fire Doors.—Fire doors shall be classified as two-hour or one-hour fire doors:—

- (a) Two-hour fire doors shall be wood-cored metal-clad doors complying with the Specification for Construction and Installation of Fire Doors of the Fire and Accident Underwriters Association of the Commonwealth or any other type which will provide equivalent resistance to fire, the spread of fire and smoke, and transmission of heat when subjected to the Standard Fire Test, and which is otherwise suitable and approved by the Fire and Accident Underwriters Association of the Commonwealth.
- (b) One-hour fire doors shall be hollow metal or metal-clad doors, capable of providing resistance of one hour to fire, to spread of fire and smoke, and to transmission of heat when subjected to the Standard Fire Test, and which are approved by the Fire and Accident Underwriters Association of the Commonwealth.
- (c) Where a one-hour fire door is required by this Building Manual a properly framed solid or solid-core hardwood door of not less than $1\frac{3}{4}$ inches finished thickness, and of scantlings in no case less than $3\frac{3}{4}$ inches by $1\frac{3}{4}$ inches in sectional area shall be permitted.
- (d) Where a one-hour fire door is required by this Building Manual a door having a higher fire rating may be used in place thereof.
- (e) Except in special circumstances approved by an officer authorized by the Board, no opening protected by a fire door shall exceed 56 square feet in area.

- (f) Where glazing is permitted in fire doors elsewhere in this Manual, such glazing shall not exceed 2 square feet in superficial area, shall be secured with metal beads, and shall consist of—
- (i) wire glass not less than $\frac{1}{4}$ inch thick;
 - (ii) electro-copper glazing not less than $\frac{1}{4}$ inch thick, the area of each individual pane being not more than 16 square inches.
- (g) All fixings, frames, sills, fastenings, and other details of fire doors shall be in accordance with the Specification for Construction and Installation of Fire Doors of the Fire and Accident Underwriters Association of the Commonwealth. *See* also Clause 2021 (e) Chapter 20 and Chapter 21.

808. **Fire Windows.**—(a) One-hour fire windows shall be—

- (i) electro-copper glazing or steel-framed windows glazed with wired glass, complying with the Specification for Construction and Installation of Fire Windows and Electro Copper Glazing of the Fire and Accident Underwriters Association; or
 - (ii) glass masonry assembled, constructed, and installed in accordance with the requirements of the Fire and Accident Underwriters Association of the Commonwealth.
- (b) Two-hour fire windows shall consist of two one-hour fire windows built into the one opening, with an air space between.
- (c) No opening protected by a fire window shall exceed 56 square feet in superficial area.
- (d) One-hour wired glass skylights shall be similar in construction and glazing to fire windows, and shall be supported on steel or concrete kerbs. No skylight opening shall exceed 100 square feet in superficial area.
- (e) All fixings, frames, sizes, fastenings, and other details of fire windows and skylights shall be in accordance with the Specification for Construction and Installation of Fire Windows, Electro Copper Glazing, and Wired Glass Skylights of the Fire and Accident Underwriters Association of the Commonwealth.

809. **Fire Shutters.**—Fire shutters shall be tin-clad, iron or steel gauze shutters or steel interlocking roller shutters, complying with the Specification for Construction and Installation of Fire Shutters of the Fire and Accident Underwriters Association of the Commonwealth.

CHAPTER 9.

LIVE AND DEAD LOADS.

- Clause 901. Design for Loads.
- Clause 902. Determination of Dimensions of Structural Members.
- Clause 903. Live Loads.
- Clause 904. Impact.
- Clause 905. Live Load Reductions.
- Clause 906. Partitions.
- Clause 907. Loading Notice Plates.
- Clause 908. Maximum Loading During Construction.
- Clause 909. Wind Loading.
- Clause 910. Extra Loads.
- Clause 911. Light Frame Buildings.
- Clause 912. Buildings Divided by Expansion Joints.
- Clause 913. Combined Stresses.
- Clause 914. Load on Roof Coverings.
- Clause 915. Weight of Materials.

CHAPTER 9.

LIVE AND DEAD LOADS.

901. **Design for Loads.**—Every building and every portion thereof shall be designed to withstand the forces and to support the loads both dead and alive to which it is subject, without exceeding the stresses allowed for the various materials elsewhere in this Building Manual.

902. **Determination of Dimensions of Structural Members.**—The method of determining the dimensions of structural members shall except where prescribed to the contrary in this Building Manual—

- (a) in the case of reinforced structural members, be in conformity with the S.A.A. Code for Concrete in Building No. C.A.2;
- (b) in the case of structural steel members, be in conformity with the S.A.A. Code for Structural Steel in Building No. C.A.1 and the S.A.A. Welding Code No. C.A.8;
- (c) in the cases not provided for in the S.A.A. Codes specified in the preceding sub-clauses, admit of a rational analysis and be in accordance with the established principles of mechanics and structural design; and
- (d) in the case of timber members, be in conformity with the Handbook of Structural Timber Design (Second Edition), being Technical Paper No. 32, issued by the Division of Forest Products of the Council for Scientific and Industrial Research.

903. **Live Loads.**—The maximum live loads for which the structural members of a building or portion of a building may be designed shall be the loads specified in Table 903 for the particular occupancy or for the particular occupancy most closely resembling same, but where the actual live loads to be imposed thereon exceed the loads specified in Table 903 the design shall provide for the actual live loads.

TABLE 903.
Maximum Live Loads to be Carried by Structural Members.

Class of Occupancy.	Portion.	Maximum live load— lbs. per square foot.	
Class I.—Houses	All	40	
Class II.—Flats	Common dining rooms and lounges	60	
	All other portions	40	
Class III.—Residential Buildings	Common dining rooms ..	60	
	Any room used for dancing ..	100	
	All other portions	40	
Class IV.—Dwellings attached to other classes of buildings	All	40	
Class V.—Office Buildings ..	Ground floor entrance halls, vestibules and porches	100	
	All other portions	50	
Class VI.—Shops	All	100	
Class VII.—Warehouses— (a) Garages	Floors at street level ..	150	
	Other floors— If designed for passenger cars only	75	
	If designed for storage of commercial vehicles	150	
	(b) Other warehouses ..	Portions used for display and not for storage of goods	100
	All other	150	
Class VIII.—Factories ..	All	As fixed by the Board but not more than 100	
Class IX.—Public Buildings— (a) Assembly Churches ..	Aisles and corridors ..	80	
	Other portions— Having fixed seats ..	40	
	Having movable seats ..	60	
	Dance Halls	All	100
	Libraries	Stack rooms	200
		All other	70
	Schools	Assembly rooms and corridors	80
		Other portions— Having fixed seats ..	40
		Having movable seats ..	60
	Theatres	Dressing rooms	40
		All other	100
	All other places of public assembly	100
	(b) Institutional	All	40

Class of Occupancy.	Portion.	Maximum live load— lbs. per square foot.
All classes of buildings—		
(a) Roofs, pitched	See Clause 909
(b) Roofs, flat, available for traffic or resort or acces- sible by lifts or stairs	50
(c) Roofs, flat, not available for traffic or resort or inac- cessible by lifts or stairs	10
(d) Cantilever verandahs	30
(e) Escape stairs	100
Public footpaths and arcades for pedestrian traffic only	150
Loading docks and floors (except floors of garages)	200
Those carrying vehicular traffic..	To be calculated

904. **Impact.**—Where a floor or portion of a floor in a building is to be designed to carry machinery, the maximum live load capacity shall be reduced by the addition of 150 per cent. of the weight of such machinery to the dwelling to provide for impact, and each member shall be designed to support the load so computed, provided that the dimensions of such members shall not be less than those determined under the loading requirements given in Table 903.

905. **Live Load Reductions.**—(a) In designing columns, piers and walls, the percentage reductions in total live loads set out in Table 905 (Live Load Reductions) shall be allowed.

TABLE 905.
Live Load Reductions.

	Class of Occupancy.	
	Class VII.—Ware- houses—Percentage Reductions of floor live load.	Buildings of all other classes—Percentage reduction of floor live loads.
Columns, piers and walls carrying—		
The roof	0	0
One floor and roof	0	0
Two floors and roof	0	0
Three floors and roof	5	10
Four floors and roof	10	20
Five floors and roof	15	30
Six or more floors and roof	20	40

(b) In buildings other than buildings of Class VII. Occupancy (Warehouses), a reduction of 15 per cent. of the floor live load shall be allowed in designing beams and girders carrying 300 square feet or more of floor space, but such reductions shall not be taken into account in the design of columns.

(c) Footings and base structure shall be designed to carry the live and dead loads transmitted to them after allowing for the reductions in respect of columns, piers and walls set out in Table 905.

906. **Partitions.**—The type and weight of partitions shall be specified, but where the positions are not definitely located in the design, the beams and floor slabs shall be designed to carry, in addition to the specified live load uniformly distributed, a uniformly distributed dead load per square foot equal to not less than ten per cent. of the actual weight per foot run of such partitions. Where the type and weight of partitions have not been determined, provision may be made in the design for an estimated weight and partitions subsequently erected shall not exceed such estimated weight.

907. **Loading Notice Plates.**—On completion of any building of Class VI., VII. or VIII. Occupancy constructed pursuant to a permit granted under the Building Regulations and before the occupation of any such building or portion of a building, the owner shall affix and subsequently maintain in conspicuous places on the walls thereof, not less than 3 feet above the floor, notice plates showing the safe live loads the floor or portion of the floor has been designed to support. The plates shall be in the following form:—

SAFE FLOOR LOAD.
Pounds per Square Foot
Uniformly Distributed.

908. **Maximum Loading during Construction.**—The maximum stress imposed on any part or member of a building during course of construction shall not be more than 25 per cent. in excess of the working stress specified in this Manual.

909. **Wind Loading.**—All buildings and parts of buildings exposed to wind pressure shall be designed to resist safely both during the construction and after completion the wind pressure set out below in Table 909 on the total exposed surface area, provided that where the site is sheltered from the wind, the wind loading on surfaces less than 50 feet above the ground may be taken as not less than two-thirds of the amount shown—

- (a) Walls and other vertical surfaces shall be designed for $12\frac{1}{2}$ lb. per square feet pressure on the windward side and $7\frac{1}{2}$ lb. per square foot suction on the leeward side.
- (b) Inclined surfaces shall be designed for wind loadings as set out hereunder, negative signs indicating suction:—

TABLE 909.
Plane Roof Surfaces.

Angle of inclination with horizontal (O).	Windward Slope.	Windward loading in lbs. per square foot Leeward Slope.
Less than 20° ..	-12	-9
20° to 30° ..	1.20-36	-9
Greater than 30° ..	0.30-9	-9

Rounded Roof Surfaces.*(i) Windward quarter of the roof arc.*

Ratio $\frac{\text{rise}}{\text{span}} = r$	Wind Loading in lbs. per square foot.	
	Roofs resting on elevated vertical supports.	Roofs springing from ground level.
Less than 0.2 ..	-12	For all ratios of rise to span (r) a normal pressure of 19 r lb. per square foot
0.2-0.35	$80r-28$	

(ii) Central half of the roof arc.

For all ratios of rise to span (r) a suction of $(15r + 11)$ lb. per square foot	For all ratios of rise to span (r) a suction of 11 lb. per square foot
--	--

(iii) Leeward quarter of the roof arc.

For all ratios of rise to span a suction of 9 lb. per square foot.

- (c) In addition to the loads specified in sub-clauses (a) and (b) an internal pressure (equivalent to external suction) or suction (equivalent to an external pressure) of $4\frac{1}{2}$ lb. per square foot shall be allowed for buildings nominally airtight but with small openings. For buildings in which 30 per cent. or more of the wall surface is capable of being opened, an internal pressure of 12 lb. per square foot or an internal suction of 9 lb. per square foot shall be allowed. For percentages of wall-openings between nil and 30 per cent. intermediate values shall be allowed.

910. **Extra Loads.**—In addition to the loads referred to in Clause 909 a vertical pressure of 10 lb. per square foot over the entire area of all roof surfaces shall be provided for. In buildings in which special loads, such as shafting or runways, are attached to roof trusses or other roof members such trusses or other roof members shall be designed to support the special loads as a further additional loading.

911. **Light Frame Buildings.**—Light frame buildings with large openings shall be designed to resist stresses due to wind pressure or suction caused by the existence of such openings to the satisfaction of an officer authorized by the Board.

912. **Buildings Divided by Expansion Joints.**—Where a building is divided up into sections by expansion and contraction joints, each section must be considered separately in regard to wind pressure unless the sections are suitably anchored together to the satisfaction of an officer authorized by the Board.

913. **Combined Stresses.**—For members carrying combined stresses due to wind and other loads and for members carrying wind load only, in addition to their own dead load, the working stress may be increased $33\frac{1}{3}$ per cent. provided (i) the section thus found is not less than that required under normal working stresses for all loads other than those due to wind, and (ii)

in the case of timber the increase in stress may be in accordance with the recommendations given in the Handbook of Structural Timber Design referred to in Clause 902 (d).

914. Load on Roof Coverings.—Where roof covering is supported at intervals greater than 18 inches, such covering shall be capable of supporting, without fracturing, a load of 200 lb. placed in any position between the supports, but the mere bending of the roof covering shall not be regarded as a fracture.

915. Weight of Materials.—The weight of the materials actually employed in the structure under the provision of this Building Manual shall be determined on the building, and shall not exceed those specified in the design without the approval of an officer authorized by the Board.

CHAPTER 10.

PRECAUTIONS DURING CONSTRUCTION AND PULLING DOWN OF BUILDINGS.

- Clause 1001. Protection of Public.
- Clause 1002. Protection of Workmen.
- Clause 1003. Scaffolding.
- Clause 1004. Temporary Ramps.
- Clause 1005. Protection of Adjacent Property.
- Clause 1006. Height of Walls during Construction.
- Clause 1007. Pulling down of Buildings.
- Clause 1008. Alterations to Buildings.
- Clause 1009. Storage of Materials.
- Clause 1010. Sanitary Accommodation for Workmen.

CHAPTER 10.

PRECAUTIONS DURING CONSTRUCTION AND PULLING DOWN OF BUILDINGS.

1001. **Protection of Public.**—(a) Where a building is to be constructed or pulled down at or adjoining the building line of any street, precautions shall be taken to ensure the safety of the public using such street and particulars for such precautions shall be submitted to and approved by an officer authorized by the Board before any work is commenced.

(b) Where any excavations connected with the construction or pulling down of any building are made in or adjoining any street, such excavations shall be adequately fenced, and at night, lighted to prevent injury to the public and where considered necessary by an officer authorized by the Board shall be properly timbered to prevent damage to such street.

1002. **Protection of Workmen.**—(a) The builder shall make due provision for safe working throughout all building operations so that no workmen are subjected to unnecessary risks or danger and shall put into effect at his own expense any further precautions that an officer authorized by the Board may deem necessary.

(b) Where excavations connected with the construction or pulling down of any building require to be timbered such timbering shall be so constructed as to afford in the opinion of the Board, or an officer authorized by the Board, adequate protection for workmen employed.

1003. **Scaffolding.**—When a scaffolding is necessary for any building operation, the footpath or ground adjacent to such scaffolding shall be covered over and kept covered over to the satisfaction of an officer authorized by the Board until the completion of the work so that any person may not be endangered or inconvenienced by falling materials.

Such scaffolding shall be erected in conformity with the requirements of the Scaffolding Ordinance and be maintained to the satisfaction of an officer authorized by the Board and removed as soon as possible after completion of the work requiring its use. Where such scaffolding has been erected over or upon a public footpath, such footpath shall be reinstated, and all damaged portions made good or renewed and left in a condition satisfactory to an officer authorized by the Board.

1004. Temporary Ramps.—Where temporary ramps are required to provide access to excavations in connexion with any building operations, such ramps shall be constructed to a suitable grade and have the necessary strength and stability. Every ramp shall have a minimum width of 10 feet between kerbs and a guide or kerb on each side at least 9 inches in height and 6 inches in width.

1005. Protection of Adjacent Property.—(a) (i) Where excavation or demolition is to be made in proximity to an existing building the walls of such building shall be shored and/or underpinned and/or protected as may be necessary in the opinion of an officer authorized by the Board to ensure stability.

(ii) Where the foundation of an existing building is of material likely to become unstable as a result of the excavation of adjoining ground additional precautions to the satisfaction of an officer authorized by the Board shall be taken to ensure its stability.

(iii) Underpinning shall be in conformity with the requirements of Clause 1414.

(b) Where the foundation of an existing building consists of hard stable rock the requirements of sub-clause (a) relating to underpinning may be dispensed with.

1006. Height of Walls During Construction.—No wall or portion of a wall shall, during its construction, be built to a height greater than 5 feet or six times its thickness, whichever is the greater, unless it is supported by temporary shores, proper scaffolding or buttresses at intervals of length of not greater than thirty times its thickness, until such time as roof or floor ties or cross walls are in position.

1007. Pulling Down of Buildings.—The following requirements in connexion with the pulling down of buildings shall be complied with:—

(a) Unless otherwise approved by an officer authorized by the Board, story after story shall be completely removed;

(b) Materials being removed from any building shall not be placed upon the floor or floors of such building, but shall be lowered to the ground immediately upon displacement and removed from site unless otherwise permitted by an officer authorized by the Board;

(c) No portion of any external wall abutting on any street shall be pulled down except between such hours as an officer authorized by the Board may direct;

(d) For the purpose of preventing or lessening nuisance from dust, material displaced from a building shall be kept sprayed with water.

1008. **Alterations to Buildings.**—Where alterations are being made to any building, every portion of the building likely to become structurally insecure by reason of such alterations shall be adequately shored up and supported to the satisfaction of an officer authorized by the Board.

1009. **Storage of Materials.**—No builder shall deposit or store any material whatsoever on a public street, footpath, or other public ground except for the purpose of immediate transportation of such material on to the building site or ground being used for the purposes of building operations. In such case the receipt and transportation shall be carried out as expeditiously as possible and at such times as in special circumstances an officer authorized by the Board may direct so as to cause the least possible obstruction to traffic on the street or footpath and with due precautions for the public safety and convenience.

Any part of the street or footpath for which the builder has procured a licence for use and enclosure by a hoarding shall be deemed part of the building site for the purposes of this clause for the period covered by such licence.

1010. **Sanitary Accommodation for Workmen.**—(a) In connexion with the construction of all buildings, approved sanitary accommodation shall be provided on the site of the works, the number of closets being at least one twentieth of the maximum number of men simultaneously employed thereon.

(b) Every closet not connected to a sewerage system shall be placed at the rear of the site at least 4 feet from any boundary fence and 25 feet from any house and shall be constructed to the satisfaction of the Health and Municipal Authorities except that an impervious floor shall not be required.

CHAPTER 11.

DAMPNESS AND DRAINAGE OF SITE.

- Clause 1101. Land Liable to Flooding.
- Clause 1102. Land without Proper Means of Drainage.
- Clause 1103. Stormwater Drains.
- Clause 1104. Treatment of Ground beneath the Building.
- Clause 1105. Sub-soil Drainage.

CHAPTER 11.

DAMPNESS AND DRAINAGE OF SITE.

1101. **Land Liable to Flooding.**—(a) Except as provided in sub-clause (b) hereof, no building shall be constructed upon any land liable to be flooded or inundated by water.

(b) The Board may permit a building to be constructed on any such land provided that—

- (i) the surface at the lowest floor and all inlets to a sewerage system are constructed to a level approved by an officer authorized by the Board, but in any case not lower than 12 inches above the maximum flood level;
- (ii) measures approved by an officer authorized by the Board are taken to prevent the retention of flood waters and flood debris beneath the building.

1102. **Land without Proper Means of Drainage.**—(a) No building intended or adapted to be used wholly or partly for residential purposes shall be constructed upon land which cannot at all times be efficiently drained by gravitation into some adjoining street, channel or drainage easement on to, through, or over which such drainage may lawfully be discharged.

(b) The Board may permit buildings of Class V., VI., VII., or VIII. Occupancy to be constructed on such land provided that the requirements of Clause 1103 are complied with.

1103. **Stormwater Drains.**—(a) Every new building, or every existing building that is being altered or extended, shall be provided with a complete and effective system of stormwater drains to the satisfaction of an officer authorized by the Board for the collection of stormwater discharged from the roof of the building and the interception and collection of storm and surface water from the allotment on which the building is erected, and the conveyance of such storm and surface water to some point where it may be lawfully discharged.

(b) Such drains shall—

- (i) be constructed of cast iron, brick, stone, concrete, salt-glazed ware, or other material approved by an officer authorized by the Board;

- (ii) be constructed to regular falls and be at every point of sufficient capacity to carry the whole of the water collected;
- (iii) where the line of any such drain crosses any public footway, be constructed in conformity with the requirements of an officer authorized by the Board.

(c) Downpipes connected to such drains for the collection of roof water may be exposed inside a building provided they are constructed in cast iron or sheet metal of not less than 24 B.W.G.

(d) Downpipes when inside a building and encased in such a manner as to be inaccessible shall be of copper, wrought iron, cast iron, or other approved non-corrosive material.

1104. Treatment of Ground beneath the Building.—Where an officer authorized by the Board considers it necessary, the surface of the ground beneath any building shall be regraded and provided with adequate outlets to prevent any accumulation of water beneath the floors, and if so directed covered with approved damp resisting material.

1105. Sub-soil Drainage.—Where an officer authorized by the Board considers such action necessary, the sub-soil of the site of any new building shall be drained by means of a system of sub-soil drains laid to an approved outfall. The layout and type of drains and the method to be used for disposing of the sub-soil water shall be approved by an officer authorized by the Board.

CHAPTER 12.

EXCAVATION.

- Clause 1201. Depth of Foundation Excavation.
- Clause 1202. Inspection of Foundation Excavations.
- Clause 1203. Retaining Walls.
- Clause 1204. Removal of Water from Excavations.
- Clause 1205. Excavation Adjacent to Adjoining Buildings.

CHAPTER 12.

EXCAVATION.

1201. **Depth of Foundation Excavation.**—(a) Subject to the provision of Clause 1301 of this Building Manual, excavations for foundations shall be taken to such depths as will, in the opinion of an officer authorized by the Board, give a foundation capable of effectively supporting the loads to be imposed thereon by the footings.

(b) Where a wall has a continuous footing which is not suitably reinforced, the minimum width and depth shall be as follows: —

(i) **Width.**—The footings shall be at least 8 inches wider than the thickness of the wall resting upon it, measured at the level of the lowest floor, such additional width extending equally on each side of the wall, except where it adjoins a boundary or another wall.

(ii) **Depth.**—The depth of the footing shall not be less than 12 inches, unless the foundation consists of firm rock.

1202. **Inspection of Foundation Excavations.**—Twenty-four hours notice in writing shall be given to an officer authorized by the Board when excavations for foundations are ready for inspection and no footings shall be placed in position until the excavations have been inspected and approved by an officer authorized by the Board.

1203. **Retaining Walls.**—All permanent excavations with slopes steeper than the angle of repose or natural slope of the soil shall have retaining walls of masonry or reinforced concrete of sufficient strength and stability to retain the embankment together with any surcharged loads.

1204. **Removal of Water from Excavations.**—Water shall be removed from excavations before concrete is deposited, unless otherwise directed by an officer authorized by the Board. Any flow of water into the excavations shall be diverted through proper side drains to a sump, or shall be removed by other approved methods which will avoid washing the freshly deposited concrete. Unused water, vent and drain pipes if left in position shall have all openings filled by grouting or otherwise.

1205. **Excavation Adjacent to Adjoining Buildings.**—*See* Clause 1005.

CHAPTER 13.

FOUNDATIONS AND FOOTINGS.

- Clause 1301. Loading on Foundations.
- Clause 1302. Pile Foundations.
- Clause 1303. Pile Driving Formula.
- Clause 1304. Tests may be Required.
- Clause 1305. Foundation Tests.
- Clause 1306. Pile Loading Tests.
- Clause 1307. Footings.
- Clause 1308. Projection of Footings.

CHAPTER 13.

FOUNDATIONS AND FOOTINGS.

1301. **Loading on Foundations.**—The maximum loading per square foot which any footing shall be permitted to transmit to its foundation shall—

- (a) where the bearing capacity of the foundation has been tested, be not more than the bearing capacity disclosed by such test;
- (b) where the bearing capacity of the foundation has not been tested, be not more than the loading shown in Table 1301 for the particular material comprising the foundation.

TABLE 1301.
Allowable Intensity of Pressure on Foundations.

Kind of Material.	Tons per square foot.
Alluvial soil, made ground, very wet sand	$\frac{1}{2}$
Soft clay or loam	1
Ordinary clay and dry sand mixed with clay	2
Dry sand and dry clay	3
Hard clay and firm coarse sand	4
Firm coarse sand and gravel	6
Shale rock	8
Soft sandstone	12
Medium sandstone	20
Hard sandstone (free of seams to a depth of 6 ft.)	30
Hard igneous rock	40

1302. **Pile Foundations.**—(a) Where the bearing capacity of the foundation is not adequate to support a building or a portion of a building, such building or portion thereof shall be erected on a foundation of piles.

(b) All piles shall be designed to withstand the forces involved in the handling and driving and to support the live and dead loads without exceeding the stresses laid down in this Building Manual.

(c) (i) Piles may be driven by drop hammers or steam hammers or forced down by hydraulic rams or other suitable means. The work shall be done in such a manner as not to injure the pile, and any pile injured shall be withdrawn and rejected provided that if only the head of the pile is injured, the injured portion only need be removed. The remaining portion of this pile must be adequately embraced by the pile capping, which shall be designed to transmit the whole of the live and dead loads from the building to the piles and to distribute it as required amongst the piles.

(ii) In all cases jetting may be used to assist the driving, but the jetting shall be discontinued in the final stages and the requisite resistance of the pile reached by the application of hammer blows or pressure methods only.

(d) Where the piles are driven, the total load on any pile shall not exceed the allowable value as determined by the Hiley Pile-driving formula given in Clause 1303.

(e) Where piles are forced down by applied pressure, the total applied pressure at which the piles cease to subside shall not be less than the live and dead loads to be supported by such piles.

1303. Pile Driving Formula.—(a) The Hiley Formula shall be deemed to be:—The load on any pile shall not exceed the allowable value determined from the equation—

$$R = \frac{4n}{s} + \frac{Wh}{c/2}$$

Where R is the allowable load on the piles in pounds.

n, the efficiency of the blow as prescribed in paragraph (b) hereof.

W, the weight of the striking part of the hammer in pounds.

h, the height of the free fall of the hammer in feet as prescribed in paragraph (c) hereof.

s, the average penetration per blow in inches for the last five blows; (s shall be measured during the driving and not upon re-driving when a pile has been allowed to stand more than one hour after having been driven. In the case of wood piles, broomed heads shall be cut out to sound wood before making penetration measurements.)

c, the sum of the temporary elastic compressions of the pile, the driving head and the ground. (The value of (c) may be determined experimentally or may be estimated from the values given in paragraph (d) hereof.)

(b) Estimation of the Efficiency of the Blow (n).—Where the pile is driven into penetrable ground the efficiency of the blow shall be assumed to be given by the equation—

$$n = \frac{W + O^2P}{W + P}$$

For the special case where a pile point meets with refusal on impenetrable rock the efficiency of the blow shall be assumed to be—

$$n = \frac{W + O.5e^2P}{W + O.5P}$$

Where P is the weight of the pile which includes helmet or driving cap or anvil;

e, is the coefficient of restitution of the hammer on the pile.
(This shall be assumed to have the following values:—

0.5 for steel ram of double-acting hammer striking on steel anvil and driving steel sheet piles or reinforced concrete piles.

0.4 for steel ram of double-acting hammer striking on steel anvil and driving timber piles.

0.4 for cast iron ram of single-acting or drop hammer striking directly on head of reinforced concrete pile not fitted with a helmet.

0.33 for ram of single-acting hammer striking on a 1 inch thick plate on the top of a helmet containing a wood cap fitted to a 16 x $\frac{1}{4}$ inch steel piling tube.

0.25 for cast iron ram of single-acting or drop hammer striking on well conditioned wood cap of helmet in driving reinforced concrete piles or directly on head of timber pile.

0.25 for steel piling tubes driven by a mandrel and

0.0 for a deteriorated condition of head of timber pile or of the wood cap and for excess of packing in helmet.)

(c) The values of h shall be taken as:—

H for drop hammers released by a monkey trigger;

0.9H for single-acting steam hammers;

0.8H for drop hammers actuated by a wire rope from friction winch;

Where H is the actual strike of the hammer or ram in feet.

For double-acting hammers:—

$$h = \frac{H(W + AQ)}{W}$$

Where A is the area of the piston in square inches acted on by the steam, and Q is the mean effective steam pressure in pounds per square inch.

Alternatively, Wh may be determined by means of an approved device attached to the hammer measuring the actual energy in foot pounds per blow delivered. Where single-acting hammers or drop hammers work in leader guides inclined at an angle ϕ from the vertical a further allowance must be made for the frictional resistance of the guides and for the reduced component of gravity acting along the direction of the guides. This shall be done by substituting for h—

$$h = h (\cos \phi - M \sin \phi)$$

Where M is the coefficient of friction (usually 0.1).

(d) The total temporary compression in inches (c) occurring at each blow the hammer shall be determined by measurement during the driving of the pile, or alternatively may be estimated approximately by calculation using the following formula:—

$$c = \frac{3R(L)}{A(E + .0001)}$$

R may be the allowable load in pounds assumed in the design unless the allowable load computed from the penetration varies more than 20 per cent. from such assumed load;

A is the area of cross section of the pile, or in the case of a pile driven by a mandrel or a tube, the area of cross section of the mandrel or tube, in square inches;

L is the length of the pile, tube or mandrel in inches; and

E is the modulus of elasticity of the material of the pile, tube or mandrel in pounds per square inch.

(e) Penetration for an allowable load.—The penetration (s) for an allowable load may be determined from the Hiley Formula as given in the preceding paragraphs of this clause. A negative value of s indicates that a heavier hammer must be used.

1304. **Tests may be Required.**—Whenever the supporting capacity of a foundation or of a pile is in the opinion of an officer authorized by the Board doubtful, he may require tests to be made to enable him to determine the loading to be permitted thereon. The loading so determined shall be taken as the allowable loading.

1305. **Foundation Tests.**—(a) Wherever a test of a foundation is required, a test pit with vertical sides shall be excavated to the level of the proposed footing and the test load shall be applied over an area of at least 1 square foot (allowance should be made for the fact that on certain types of soil the unit bearing value under large footings is less than that under small footings). This load shall be of the same intensity as it is proposed to use in service, provided that in filled ground, it shall be one and a half times as great. It shall be left undisturbed for 24 hours after settlement has ceased, and be doubled by the successive application, at intervals of at least four hours, of at least four equal increments. The total load shall be left undisturbed until 24 hours after settlement has ceased. The soil so tested shall be deemed adequate for the proposed intensity of loading if the settlement under the intensity of loading proposed for use in service is less than $\frac{3}{8}$ inch and if the total settlement throughout the test does not exceed $\frac{3}{4}$ inch.

(b) Measurement of settlement shall be made every hour for six hours after each application of load and at least every twelve hours thereafter.

1306. **Pile Loading Tests.**—In testing a pile in place, it shall be loaded to twice its proposed working load, by additions at not less than four hour intervals of loads of not more than 5 tons. Measurement of settlement shall be made and recorded immediately before and after the addition of each load. Such measurements shall be adjusted to compensate for the elastic compression of the pile. The pile shall be considered adequate to support the proposed working load if the total settlement so measured does not exceed $\frac{1}{2}$ inch and if no further settlement occurs after a lapse of 48 hours.

1307. **Footings.**—(a) Every building shall have a complete system of footings constructed of concrete conforming to the requirements of Clause 711 and capable of transmitting the whole of the dead and live loads from the building to the foundation in such a manner that the pressure on the

foundations in no place exceeds that permitted by Clause 1301 and the stresses in the materials of the footings do not exceed those permitted for such materials as prescribed in Chapter 7.

(b) Where a wall has a continuous footing which is not suitably reinforced, the minimum width and depth shall be as follows:—

(i) Width: The footings shall be at least 8 inches wider than the thickness of the wall resting upon it, measured at the level of the lowest floor, such additional width extending equally on each side of the wall, except where it adjoins a boundary or another wall.

(ii) Depth: The depth of the footing shall be not less than 12 inches, unless the foundation consists of firm rock.

(c) In all pier and column footings, the centroid of pressure under each footing shall reasonably coincide with the centre of gravity of the load supported by the footing.

(d) Notwithstanding the intensity of bearing pressure between footing and foundation, the footing shall be so designed that, in the opinion of an officer authorized by the Board, a reasonable measure of protection is afforded against relative movement of the supporting ground occasioned by alterations in moisture content or other causes.

1308. Projection of Footings.—Footings shall not extend more than 12 inches beyond the street alignment, provided that where the highest part thereof is not less than 6 feet below the level of the ground, they may extend not more than 3 feet beyond the street alignment.

CHAPTER 14.

WALLS AND PARTITIONS IN TYPES 1, 2 AND 3 CONSTRUCTION.

PART I.—GENERAL PROVISIONS.

- Clause 1401. Materials.
- Clause 1402. Masonry.
- Clause 1403. Hollow Masonry Blocks.
- Clause 1404. Wall Fulfilling More than One Function.
- Clause 1405. Permissible Tolerance.
- Clause 1406. Framing into Walls.
- Clause 1407. Expansion Joints.
- Clause 1408. Facings.
- Clause 1409. Structures Above Level of Roof.
- Clause 1410. Arches and Lintels.

PART II.—BASE STRUCTURES.

- Clause 1411. Construction.
- Clause 1412. Thickness.
- Clause 1413. Hollow Wall.
- Clause 1414. Underpinning.
- Clause 1415. Ventilation.

PART III.—EXTERNAL BEARING WALLS AND PARTY WALLS.

“ A ” Masonry Walls.

- Clause 1416. Bonding.
- Clause 1417. Corbelling.
- Clause 1418. Thickness of Walls.
- Clause 1419. Piers in Walls.
- Clause 1420. Reduction in Thickness of Walls.
- Clause 1421. Thickness in Relation to Height of Story.
- Clause 1422. Walls in Class VII. and VIII. Occupancies.
- Clause 1423. Buildings of One Story.
- Clause 1424. Lime Mortar in One-story Buildings.
- Clause 1425. Hollow Walls.
- Clause 1426. Recesses and Openings.
- Clause 1427. Chases.
- Clause 1428. Designed Walls.
- Clause 1429. Hollow Concrete Blocks.

“ B ” Concrete Walls.

- Clause 1430. Concrete Walls.
- Clause 1431. Reinforced Concrete Walls.
- Clause 1432. Reinforcement.
- Clause 1433. Chases and Recesses.

“ C ” Special Provision for Walls of Houses and Flats.

- Clause 1434. Use of Other Materials or Methods of Construction.

PART IV.—EXTERNAL NON-BEARING WALLS.

- Clause 1435. Panel Walls.

PART V.—CROSS WALLS, FIRE WALLS AND INTERNAL BEARING WALLS.**“ A ” Masonry Walls.**

- Clause 1436. Materials.
- Clause 1437. Construction.
- Clause 1438. Design.

“ B ” Concrete Walls.

- Clause 1439. Reinforced Concrete Walls.
- Clause 1440. Junctions.
- Clause 1441. Reinforcement.
- Clause 1442. Chases and Recesses.

PART VI.—PARTITIONS.

- Clause 1443. Thickness.

PART VII.—PARAPETS.

- Clause 1444. In Party and Fire Walls.
- Clause 1445. Construction.
- Clause 1446. Damp-proofing.

PART VIII.—DAMP COURSES.

- Clause 1447. Horizontal Dampcourse.
- Clause 1448. Crushing Strength of Mortar.
- Clause 1449. Position of Horizontal Dampcourse.
- Clause 1450. Damp-proofing of Parapets.
- Clause 1451. Vertical Dampcourse.
- Clause 1452. Position of Vertical Dampcourses.
- Clause 1453. Hollow Walls.
- Clause 1454. Junction of Dampcourses.

PART IX.—EXISTING WALLS.

- Clause 1455. Approval Required to Increase Thickness.
- Clause 1456. Construction.

CHAPTER 14.**WALLS AND PARTITIONS IN TYPES 1, 2 AND 3 CONSTRUCTION.****Part 1.—General Provisions.**

1401. **Materials.**—Every building of Type 1, 2 and 3 Construction shall be enclosed with external walls of masonry, concrete, reinforced concrete, or other hard and incombustible materials.

1402. **Masonry.**—The term “ masonry ” shall mean stone, brick, terra cotta block, solid or concrete block, or other similar building unit or materials or a combination of them, laid up unit by unit and set in mortar.

1403. **Hollow Masonry Blocks.**—Hollow masonry blocks shall not be used in bearing walls except in one-story buildings.

1404. **Wall Fulfilling More than One Function.**—Where any wall is required to fulfil more than one of the functions specified in this Manual, it shall be constructed in accordance with the highest standard in any respect for any of its functions.

1405. **Permissible Tolerance.**—A tolerance of $\frac{1}{4}$ inch will be permitted in each $4\frac{1}{2}$ -in. of thickness for variation of brick sizes. This tolerance will not apply to foundation widths.

1406. **Framing into Walls.**—Where structural steel beams or other metal members frame into external, party, or fire walls, the ends shall have protection against fire appropriate to the rating specified for the wall. Where wooden joists, beams or other combustible members frame into such walls, the ends shall not extend beyond the centre of such walls, and shall be not less than $4\frac{1}{2}$ inches from similar members framing into the opposite side of the wall.

1407. **Expansion Joints.**—Expansion joints shall be provided in all masonry, concrete, or reinforced concrete walls which continue for a distance of more than 100 feet in the case of masonry walls or 80 feet in the case of concrete or reinforced concrete walls.

1408. **Facings.**—(a) Facings shall consist of—

- (i) Stone or synthetic stone not less than 2 inches thick.
- (ii) Architectural terra cotta not less than 4 inches thick.
- (iii) Ceramic veneer not less than 1 inch thick.
- (iv) Flat tiles not less than 1 inch thick.
- (v) Other approved materials.

(b) Facings may be used on the outer face of reinforced concrete or masonry walls, provided that each unit of the facing shall be tied to the structural walling with substantial non-corrosive metal wall ties.

(c) Facings required to contribute to the strength of the wall shall be not less than 4-in. thickness in every part and shall be built concurrently with the wall and bonded into the backing for not less than 4 inches every third course. Such facings shall have an ultimate compressive strength equal to or greater than that of the masonry wall to which it is bonded and may be considered as part of the wall in computing the thickness and strength of such wall. Except when the provisions of the preceding sub-clause are complied with, facings shall not be considered as part of the wall in computing its strength or thickness.

(d) In the case of facing 2 inches or less in thickness, horizontal chases at not more than 18-in. centres shall be provided in the structural walling with vertical steel rods not more than 16 inches apart, secured to non-corrosive metal anchors, built into the walling. The facing shall be filled in solid at back with cement mortar.

(e) Architectural terra cotta shall be used only in conjunction with brick wallings and shall be bonded to same by setting the brickwork into the interstices of the terra cotta blocks.

(f) The provision of sub-clause (b) hereof shall not apply to tiles having a thickness of less than 1 inch, but such tiles shall not be used above a height of 8 feet from the level of the footpath.

(g) In the case of tile facings on reinforced concrete walls open or mastic joints shall be provided at intervals of not more than 5 feet horizontally and vertically.

(h) Where necessary, additional fixings for the support of facings shall be provided to the approval of an officer authorized by the Board.

1409. **Structures above Level of Roof.**—Notwithstanding anything contained in Chapter 2 or elsewhere in this Chapter, structures not exceeding 10 feet either in length or width, and not exceeding 8 feet in height and

intended for the protection of ventilating machinery or for a like purpose may be constructed above the level of the roof of a building of Type 1, 2 or 3 Construction with external walls of masonry not less than 4 inches in thickness and with a roof of impervious material.

1410. **Arches and Lintels.**—(a) Arches shall be constructed of masonry or reinforced concrete, shall be well built and keyed, and shall have good and sufficient abutments.

(b) Lintels shall be of stone, reinforced concrete, or reinforced masonry, or of iron or steel of approved sections.

(c) Where steel angles are used for lintels in external walls, the masonry shall bear at least $2\frac{3}{4}$ inches on such angles.

(d) Lintels shall have a bearing on the wall at each end measured in the direction of their length of not less than $4\frac{1}{2}$ inches.

Part II.—Base Structures.

1411. **Construction.**—A base structure shall be a continuous wall or piers and beams capable of transmitting to the footings the whole weight of the building, together with the live loads, and shall be constructed of masonry concrete, or reinforced concrete, provided that hollow masonry shall not be used below ground line.

1412. **Thickness.**—Every base structure shall be of not less thickness than the wall it supports, and where it is built of solid masonry shall be built in cement or other composition mortar. Where a base structure constructed as a continuous wall is of the same thickness as the wall it supports, and in addition supports a floor load, the structural members of such floor shall be carried, in the case of—

(a) base structures of $4\frac{1}{2}$ inches or less in thickness with a floor on one side only, on at least 9-in. by $4\frac{1}{2}$ -in. piers at not more than 4-ft. 6-in. centres bonded into the base structure.

(b) base structure $4\frac{1}{2}$ inches or less in thickness with a floor at the same level on each side and base structures more than $4\frac{1}{2}$ inches in thickness either on piers as in (a) above or on offset or corbel courses provided that where the floor is continuous through the walls, offsets or corbels shall not be required.

For the purpose of this clause, the inner portion of a hollow wall used as a base structure shall be deemed to be the base structure.

1413. **Hollow Wall.**—Where a base structure supports a hollow wall, the base structure may be built as a hollow wall provided filling of concrete or of composition or cement mortar is placed therein as the wall is built, to a height at least 3 inches above ground level.

1414. **Underpinning.**—The underpinning of walls, piers, columns and chimneys—

(a) shall rest upon solid ground or upon footing conformed to the requirements of Chapter 13;

(b) shall be built of cement concrete, or of stone or brick bedded in cement mortar and securely wedged up and/or caulked to the full thickness if the increased height of the wall or additional soil pressure so requires;

- (c) may notwithstanding the provision of the preceding sub-clause, be carried out by a system of isolated piers or piers and beams.

1415. **Ventilation.**—Base structures shall be ventilated as provided in Clause 1420.

Part III.—External Bearing Walls and Party Walls.

A. Masonry Walls.

1416. **Bonding.**—All masonry external bearing walls and party walls shall be properly bonded and solidly put together with composition or cement mortar or, as provided in Clause 1424, with lime mortar, and walls shall be bonded together at junctions.

1417. **Corbelling.**—No portion of any such wall supported on corbelling shall overhang any part below it to a greater extent than 9 inches, and then only provided the projection be well and solidly corbelled out and that the inside of the wall carrying such corbelling be carried up vertically in continuation of the lower face thereof to sufficient height to ensure stability.

1418. **Thickness of Walls.**—The minimum thickness of every external and party wall in Types 2 and 3 Construction shall be as specified in Table 1418 for the appropriate class and story, subject to the provision of Clause 725 and to the modification set out in Clauses 1419 to 1423.

TABLE 1418.

Thickness of External and Party Walls in Types 2 & 3 Construction.
SECTION 1—Buildings of Classes I., II., III., IV., V. and X. Occupancies.

Length of Wall.	Number of Stories.	Thickness of Wall in Inches.	
		If built in composition mortar.	If built in cement mortar.
Not exceeding 20 feet	1	9	9
	2	9, 9	9
	3	13½, 9, 9	9, 9, 9
	4	13½, 13½, 9, 9	13½, 9, 9, 9
Not exceeding 35 feet	1	9	9
	2	13½, 9	9, 9
	3	13½, 13½, 9	13½, 9, 9
	4	18, 13½, 13½, 9	13½, 13½, 9, 9
Not exceeding 50 feet	1	13½	9
	2	13½, 13½	13½, 9
	3	18, 13½, 13½	13½, 13½, 9
	4	18, 18, 13½, 13½	18, 13½, 13½, 9
	5	18, 18, 18, 13½, 13½	18, 18, 13½, 13½, 9
	6	22½, 18, 18, 18, 13½, 13½	18, 18, 18, 13½, 13½, 9
Exceeding 50 feet ..	1	13½	9
	2	13½, 13½	13½, 9
	3	18, 13½, 13½	13½, 13½, 9
	4	18, 18, 13½, 13½	18, 13½, 13½, 9
	5	22½, 18, 18, 13½, 13½	18, 18, 18, 13½, 13½
	6	22½, 22½, 18, 18, 13½, 13½	22½, 18, 18, 18, 13½, 13½

SECTION II—Buildings of Class VI., VII., VIII., and IX. Occupancies.

Length of Wall.	Number of Stories.	Thickness of Wall in Inches.	
		If built in composition mortar.	If built in cement mortar.
Not exceeding 35 feet	1	9	9
	2	13½, 9	9, 9
	3	13½, 13½, 9	13½, 9, 9
	4	18, 13½, 13½, 9	13½, 13½, 9, 9
Not exceeding 75 feet	1	13½	13½
	2	18, 13½	13½, 13½
	3	18, 18, 13½	18, 13½, 13½
	4	22½, 18, 18, 13½	18, 18, 13½, 13½
	5	22½, 22½, 18, 18, 13½	22½, 18, 18, 13½, 13½
	6	22½, 22½, 18, 18, 13½	22½, 22½, 18, 18, 13½, 13½
Exceeding 75 feet ..	1	18	13½
	2	18, 18	18, 13½
	3	22½, 18, 18	18, 18, 13½
	4	22½, 22½, 18, 18	22½, 18, 18, 13½
	5	22½, 22½, 22½, 18, 18	22½, 22½, 18, 18, 13½
	6	27, 22½, 22½, 22½, 18, 18	22½, 22½, 22½, 18, 18, 13½

1419. **Piers in Walls.**—Where in Section I. of Table 1418 walls exceeding 50 feet in length are required to have a greater thickness than walls not exceeding 50 feet in length, and where in Section II. of the said table walls exceeding 75 feet in length are required to have a greater thickness than walls not exceeding 75 feet in length, such additional thickness may be in the form of equally spaced piers projecting 4½ inches, provided the aggregate width of the piers shall amount to at least one-quarter of the length of the wall.

1420. **Reduction in Thickness of Walls.**—(a) In building of Type 2 Construction the thickness required by Section I. of Table 1418 for walls exceeding 50 feet in length may be reduced to that required for walls from 35 to 50 feet in length, and the thickness required by Section II. of Table 1418 for walls exceeding 75 feet in length may be reduced to that required for walls not exceeding 75 feet in length.

(b) In building of Type 2 or Type 3 Construction the thickness of external or party walls of reinforced brick masonry may be 4½ inches less than that prescribed by Table 1418 provided such walls are constructed in accordance with the requirements of Clauses 1815, 1816, 1817 (c) and are not in any case less than 9 inches in thickness.

1421. **Thickness in Relation to Height of Story.**—If any story exceeds in height eighteen times the thickness prescribed for the walls of such story, the thickness of every external wall and party wall throughout such story shall be increased to one eighteenth part of the height of such story, and the thickness of every such wall below that story shall be increased to a similar thickness, but 4½ inches of such additional thickness may be confined to piers properly distributed and having an aggregate width of not less than one fourth part of the length of the wall.

1422. **Walls in Class VII. and VIII. Occupancies.**—In buildings of Classes VII. and VIII. Occupancies containing not more than one story, walls from 35 feet to 75 feet in length may be constructed to a thickness of 9 inches, provided that—

- (a) they shall be strengthened by equally spaced piers projecting $4\frac{1}{2}$ inches and having an aggregate width of not less than one-fifth part of the length of the walls; and
- (b) the height of such walls shall not exceed 12 feet where built in lime mortar or 13 ft. 6 in. when built in cement or composition mortar.

1423. **Buildings of One Story.**—A building containing not more than one story and not intended or adapted for use for habitable purposes may be enclosed with external walls not less than $4\frac{1}{2}$ inches in thickness built in cement mortar provided that—

- (a) the width of the building measured in the direction of the span of the roof shall not exceed 20 feet, and the height of the walls shall not exceed 9 feet;
- (b) piers measuring 9 inches by $4\frac{1}{2}$ inches shall be formed at intervals of not more than 9 feet;
- (c) the roof shall be so constructed that the walls are not subject to any thrust therefrom;
- (d) such walls shall not be required to support any load other than the distributed load of the roof;
- (e) cross walls or equivalent buttresses shall be constructed at intervals of not more than 30 feet.

1424. **Lime Mortar in One-story Buildings.**—In buildings of not more than one story, walls may be built in lime mortar provided that they are of not less thickness than that specified in Table 1418 for a wall built in composition mortar.

1425. **Hollow Walls.**—External walls of buildings of all classes of occupancy may be hollow walls provided that—

- (a) the inner and outer parts of the wall shall be separated by a cavity which shall be of width throughout not greater than 3 inches;
- (b) the inner and outer parts of the wall shall be securely tied together with suitable bonding ties of adequate strength formed of galvanized iron, glazed stoneware or other approved material. Such ties shall be spaced apart not more than 27 inches horizontally, and every fourth course of brickwork vertically;
- (c) no hollow wall 11 inches or less in thickness shall be of greater superficial extent than three squares in any one story unless strengthened by a cross wall, fireplace, or projecting pier to the satisfaction of an officer authorized by the Board;
- (d) the aggregate thickness of the two parts, excluding the width of the cavity, shall be throughout not less than the minimum thickness prescribed in Table 1418 for solid walls of the same height and length and for the same class of building;

- (e) where the roof of a building of Class I., II., III., or IV. Occupancy having 11-in. hollow walls is supported by a roof truss or girders having a span of more than 25 feet, piers or stanchions shall be provided under the ends of such roof truss or girders.

1426. **Recesses and Openings.**—Recesses and/or openings may be made in an external or party wall, provided that—

- (a) the back of such recess is not less than 9 inches in thickness;
- (b) an arch of at least two rings of brickwork, an approved reinforced concrete lintel of the full depth of the recess, or an approved steel section be constructed over each recess, except a recess formed for a lift, on every story. (Where a recess does not exceed 5 inches in depth and where the back of the recess is of not less thickness than is required for the next highest story, corbelling in masonry may be substituted for the arch or lintel.);
- (c) the total area of recesses and/or openings in any story of such wall does not exceed one half of the whole elevational area of such wall in that story if segmental arch or lintel construction is used, or three-fifths of such area if approved semi-arch or continuous lintel construction is used;
- (d) the recesses do not come closer than $13\frac{1}{2}$ inches to the nearer face of any abutting or external or party wall;
- (e) the aggregate width of recesses in any story does not exceed three-quarters of the whole length of the wall in that story if segmental arch or lintel construction is used or four-fifths of such length if approved semi-arch or continuous lintel construction is used. (The Board may, however, allow wider recesses subject to the sectional area of the wall being maintained.)
- (f) the openings comply with the provision of Chapters 21 and 22;
- (g) an arch or lintel conforming to Clause 1410 be constructed over such openings;
- (h) the net sectional area of any wall after deduction of openings shall not be less than one-third of the full sectional area of such wall on plan in the case of segmental arch or lintel construction or one-fourth in the case of the semi-arch or continuous lintel construction;
- (i) the foregoing areas as to sectional requirements shall not apply to shop fronts;
- (j) shop fronts or other large openings may be framed wholly or partly in structural steel or reinforced concrete to give the necessary strength and stability, provided that all parts are properly tied or bonded to one another.

1427. **Chases.**—Chases may be made in any external or party wall, provided that—

- (a) at least 9 inches of solid material remains at back of each chase;

- (b) chases are not more than 14 inches wide or more than $4\frac{1}{2}$ inches deep, measured from the face of the wall;
- (c) chases are at least 7 feet apart if on the same side of the wall and 5 feet apart if on opposite sides.

1428. **Designed Walls.**—Compliance with the provisions of Clauses 1418 to 1425 and sub-clauses (c), (d) and (h) of Clause 1426 may be dispensed with provided that detailed computations are submitted demonstrating that the walls of a building have the necessary strength and stability and otherwise conform to the requirements of this Building Manual.

1429. **Hollow Concrete Blocks.**—Where hollow concrete blocks of the type specified in Clause 720 (f) are used in the construction of wall of a building above the base structure, the following provisions shall apply:—

- (a) Such wall shall not be a wall required by this Manual to have a thickness of more than 9 inches;
- (b) Such building shall not exceed one story or 14 feet in height;
- (c) The blocks shall be bedded and jointed in composition mortar;
- (d) Trusses, joists and beams shall rest on templates let into the wall in such a manner as to transfer the loads safely to the wall.

B. Concrete Walls.

1430. **Concrete Walls** unreinforced shall be of the same thickness as required by this Manual for masonry walls based on a unit thickness of 4 inches.

1431. **Reinforced Concrete Walls.**—Every reinforced concrete wall shall have a thickness of at least one twenty-fifth of its height or length between supports, whichever is the shorter, but in no case of less than 4 inches and shall have the necessary strength and stability. A built-in pier or pilaster introduced to reduce the length between supports shall be not less in width or depth than half of the height of such pier or pilaster. A horizontal support introduced to reduce the height between supports shall consist of a concrete slab joining the wall for the full length on at least one side or of a reinforced concrete beam of a width equal to at least one-sixteenth of the span.

1432. **Reinforcement.**—Every reinforced concrete wall shall have in each direction an amount of reinforcement of not less than .0025 of the cross-sectional area, but the amount of reinforcement in any direction may be varied in special circumstances provided the total reinforcement is not less than .005 of the cross-sectional area.

1433. **Chases and Recesses.**—No chase or recess shall be cut out or formed in any concrete or reinforced concrete wall which would impair the stability of the wall or reduce its minimum thickness to less than 4 inches.

C. Special Provision for Walls of Houses and Flats.

1434. **Use of Other Materials or Methods of Construction.**—Notwithstanding anything contained in this Building Manual, materials of a less thickness or other materials or methods than those determined in this Building Manual may be used in the Construction of Walls—whether pre-fabricated or built in situ—in buildings of Class I. or Class II. Occupancy

containing not more than two occupancies, provided that use of such materials and/or methods of construction results in walls which in the opinion of the Board—

- (a) have the necessary strength and stability and in addition provide sufficient strength and stability to the structure as a whole;
- (b) have a satisfactory heat insulation value; and
- (c) satisfactorily resist the penetration of moisture.

Part IV.—External Non-bearing Walls.

1435. **Panel Walls.**—(a) Panel walls may be constructed of masonry laid in composition or cement mortar, provided that—

- (i) every such wall shall have a thickness of not less than 9 inches if a solid wall or 11 inches if a cavity wall;
- (ii) the unsupported area of such wall between structural members shall not exceed 300 square feet;
- (iii) the outer 4½ inches of such wall may be supported on continuous steel angles bolted to the face of the structural framework, bearing on such steel angles for not less than 3 inches;
- (iv) any panel wall constructed as a hollow wall shall be securely tied as specified in Clause 1425 (b); or

(b) Panel walls may be constructed of reinforced concrete, provided that such reinforced concrete—

- (i) is not less than 4 inches thick in any part;
- (ii) is of not less thickness in any part than one-thirtieth of the unsupported height between successive floors or beams, unless laterally supported by cross walls, piers, or built-in columns at intervals not exceeding 30 times the thickness of the wall.

(c) If detailed computations are submitted demonstrating that the structure has the necessary strength and stability, the requirements of sub-clauses (a) and (b) as to minimum thickness may be waived.

Part V.—Cross Walls, Fire Walls and Internal Bearing Walls.

A. Masonry Walls.

1436. **Materials.**—Every cross wall shall be constructed of the same kind of material and in the same manner as the wall to which it provides lateral support.

1437. **Construction.**—Every cross wall, fire wall, or internal bearing wall constructed of masonry shall be properly bonded and solidly put together with composition or cement mortar or as provided in Clause 1424 with lime mortar, and every such wall shall be properly bonded at junctions. Every cross wall shall be carried up to the plate level of the topmost story.

1438. **Design.**—Where computations covering design of cross walls, fire walls and internal bearing walls are not submitted, the following requirements shall be observed:—

(a) **Thickness of Walls.**—Every such wall shall have thickness of not less than the thickness required by Table 1418 for external and party walls of the same dimensions and in the same class of building except that—

(i) a cross wall or an internal bearing wall in the topmost and second topmost stories may be $4\frac{1}{2}$ inches in thickness where the external or party wall is required by such table to be 9 inches in thickness;

(ii) no cross wall shall be required as such to exceed $13\frac{1}{2}$ inches in thickness;

(iii) every fire wall shall have a thickness of not less than 9 inches.

(b) **Thickness in Relation to Height of Story.**—If any story exceeds in height thirty-two times the thickness prescribed by subclause (a), the thickness of every cross wall, fire wall, and internal bearing wall shall be increased to $1/32$ nd part of the height of such story and the thickness of every such wall below that story shall be increased to a similar thickness provided that, except in the case of cross walls, $4\frac{1}{2}$ inches of such additional thickness may be confined to piers properly distributed, the aggregate widths of which amount to at least one-fourth part of the length of the wall.

(c) **Recesses and Openings.**—The aggregate superficial area of all recesses and openings in cross walls, fire walls, and internal bearing walls shall not exceed that permitted for external and party walls constructed of similar materials, except that if a cross wall is carried on a girder across the ground story and is supported by piers to the satisfaction of an officer authorized by the Board, it shall be deemed to be a cross wall for the purpose of this Building Manual.

B. Concrete Walls.

1439. **Reinforced Concrete Walls.**—Every such wall constructed of reinforced concrete shall have the necessary strength and stability and shall have a thickness of not less than $1/48$ th of its height or length between supports, whichever is the shorter, provided that the minimum thickness shall be 3 inches in the case of a cross wall or internal bearing wall and 4 inches in the case of fire walls.

1440. **Junctions.**—Where a reinforced concrete cross wall joins a masonry external wall such walls shall be bonded, to the satisfaction of an officer authorized by the Board, with steel reinforcing rods spaced at intervals of not more than $13\frac{1}{2}$ inches.

1441. **Reinforcement.**—Every reinforced concrete wall shall have, in each direction, an amount of reinforcement of not less than .0025 of the cross sectional area, but the amount of reinforcement in any direction may be varied in special circumstances provided the total reinforcement is not less than .005 of the cross sectional area.

1442. **Chases and Recesses.**—No chase or recess shall be cut or formed in any concrete or reinforced concrete wall which would impair the stability of the wall or reduce the minimum thickness to less than 3 inches or, in the case of a fire wall, 4 inches.

Part VI.—Partitions.

1443. **Thickness.**—The minimum thickness of every partition wall constructed of masonry or concrete shall be as determined by the formula given below, provided that the length of the wall may be reduced if stiffening piers are provided to the approval of an officer authorized by the Board—

$$T = \frac{3H + L}{200}$$

Where T = Thickness in inches;
L = Length in inches;
H = Height in inches.

Part VII.—Parapets.

1444. **In Party and Fire Walls.**—Party and fire walls shall be carried up to form parapets, except that a party wall joining buildings of Class II. Occupancy may be finished immediately below a flat roof of fire resisting construction or immediately below the roof coverings, provided such roof covering consists of fire retardant material as defined in Clause 806.

1445. **Construction.**—Every parapet shall be constructed of—

- (a) masonry set in cement or composition mortar and of a thickness not less than one-eighth of its height or 8 inches whichever is the greater;
- (b) concrete of a thickness not less than one-tenth of its height or 8 inches whichever is the greater; or
- (c) where the parapet is connected to a reinforced concrete roof or wall, reinforced concrete not less than 4 inches in thickness.

1446. **Damp Proofing.**—Every masonry parapet shall have a horizontal dampcourse as required by Clause 1450.

Part VIII.—Dampcourses.

1447. **Horizontal Dampcourse.**—(a) Every masonry wall and fireplace shall have a complete and continuous dampcourse constructed either of sheet lead, slates laid in cement mortar, approved waterproof cement mortar, approved factory prepared premixed dampcourse mortar consisting of cement and sand, waterproofing, plasticizing and colouring compounds, approved factory-pre-mixed black hydro-carbon cement dampcourse mortar, or other approved durable material impervious to moisture.

(b) When factory-pre-mixed dampcourse is used, the requisite gauging water only shall be added on the job.

(c) Tar and sand shall not be used as a dampcourse.

1448. **Crushing Strength of Mortar.**—Damp-proofing mortar shall have a crushing strength of at least equal to that of the mortar in which the wall is built.

1449. **Position of Horizontal Dampcourse.**—The dampcourse shall be laid below the level of the lowest floor, and at a height of not less than 3 inches above the surface of the ground adjoining the wall, except that when the lowest floor is of concrete on solid filling the dampcourse shall be laid at a height not less than 3 inches above the surface of the ground adjoining the wall.

1450. **Damp-proofing of Parapets.**—Where a wall is finished with a parapet, a damp-proof course, as prescribed in Clause 1447, shall be inserted at the base of the parapet unless the parapet is effectively rendered with cement or composition mortar on both sides and on the top.

1451. **Vertical Dampcourse.**—Where any portion of the walls of the lowest story of a building is below the level of and in contact with the ground adjacent to such walls, such portion shall be built as a hollow wall in accordance with the provision of Clause 1453, or shall be rendered impervious to moisture by—

- (a) a vertical dampcourse consisting of approved bituminous or asphaltic material, waterproofed cement mortar, or approved factory-prepared pre-mixed dampcourse mortar;
- (b) an approved integral water-proofing compound in the case of a reinforced concrete wall;
- (c) an approved waterproof rendering applied to the internal face of the wall; or
- (d) such other materials as may from time to time be approved by an officer authorized by the Board.

1452. **Position of Vertical Dampcourses.**—Where a wall is rendered impervious to moisture by a vertical dampcourse as prescribed in Clause 1451, such dampcourse shall be—

- (a) inserted between two parts of the wall, each of which shall have a thickness of not less than 9 inches; or
- (b) applied to the face of the wall and retained in position by a brick or other lining not less than $4\frac{1}{2}$ inches thick, such thickness being in addition to the thickness of the wall prescribed by Clause 1418 of this Building Manual, except that where the vertical dampcourse is less than 27 inches in height, such lining may be considered as part of the thickness of the wall.

1453. **Hollow Walls.**—Where portion of a wall described in Clause 1452 is built as a hollow wall—

- (a) the cavity shall—
 - (i) be not less than 2 inches wide;
 - (ii) extend to a height of 6 inches above the adjoining ground; and
 - (iii) be drained in a manner approved by an officer authorized by the Board.
- (b) horizontal dampcourses, as prescribed in Clause 1447, shall be inserted in such wall at the base and the top of the vertical dampcourse or cavity.

1454. **Junction of Dampcourses.**—Where a horizontal dampcourse provided in a wall or floor meets any vertical dampcourse, such dampcourse shall be effectively junctioned.

Part IX.—Existing Walls.

1455. **Approval Required to Increase Thickness.**—No existing wall shall be increased in thickness without the approval of an officer authorized by the Board.

1456. **Construction.**—Where an increase in the thickness of an existing wall is approved, the additional thickness shall unless otherwise approved by an officer authorized by the Board—

- (a) have a maximum thickness of $4\frac{1}{2}$ inches;
- (b) be constructed of material similar to that of the existing wall; and
- (c) be bonded in to the existing wall to a depth of not less than 4 inches and for at least one-fourth of its area.

CHAPTER 15.

FLOORS.

- Clause 1501. Floors in Type 1 and 2 Construction.
- Clause 1502. Floor Fulfilling More Than One Function.
- Clause 1503. Concrete Floors Not Required to Have a Fire Resistance Rating.
- Clause 1504. Structural Steel in Floors.
- Clause 1505. Timber Floors.
- Clause 1506. Mezzanine Floors.
- Clause 1507. Treatment of Ground Surface Beneath Buildings.
- Clause 1508. Requirements for Sub-floor Ventilation.
- Clause 1509. Openings Through Floors.
- Clause 1510. Timber Sizes.
- Clause 1511. Floors in Factories.

CHAPTER 15.

FLOORS.

1501. **Floors in Type 1 and 2 Construction.**—In buildings of Type 1 and 2 Construction floors required to have a fire resistance rating of two or three hours shall be constructed in accordance with the requirements of Chapters 8 and 18.

1502. **Floor Fulfilling More Than One Function.**—When any floor is required to fulfil more than one of the functions specified in this Building Manual it shall be constructed in accordance with the highest standard prescribed in respect of any of its functions.

1503. **Concrete Floors Not Required to Have a Fire Resistance Rating.**—Floors constructed of concrete, steel and concrete, or rib and hollow block construction and not required to have a fire resistance rating shall be designed in accordance with the provisions of Chapter 18.

1504. **Structural Steel in Floors.**—All structural steel in floors shall be designed in accordance with the provisions of Chapter 18.

1505. **Timber Floors.**—All timber construction in floors shall conform to the requirements of Chapter 19 and Clause 1812.

1506. **Mezzanine Floors.**—(a) Mezzanine floors or galleries may be constructed in buildings provided that when such floors or galleries exceed in area one-third of the total floor area of the room in which they are built they shall each be considered as constituting an additional story.

(b) The height from the ceiling beneath every mezzanine floor to the main floor level shall be not less than 7 feet clear in every part.

(c) Mezzanine floors may be constructed of timber or unprotected steel supports or of unprotected steel or iron provided that there shall not be more than two such floors in any room of any building.

1507. **Treatment of Ground Surface Beneath Buildings.**—*See* Chapter 11.

1508. **Requirements for Sub-floor Ventilation.**—When the lowest floor of any building is of timber construction, the space between the bottom of the bearers and ground immediately below shall in every part be not less than 3 feet, and the following areas of openings shall be provided in all internal and external walls forming the base structure to the floor:—

- (a) North of latitude 18°:—not less than one-fifth of the area (above ground level);
- (b) South of latitude 18°:—not less than one-tenth of the area (above ground level).

Openings shall be arranged so as to permit a continuous circulation of air to pass beneath the whole of the flooring, and spaced in the case of external structural walls not more than 5 feet apart.

1509. **Openings Through Floors.**—Where openings are formed through floors, every such opening shall be trimmed with trimmers and trimming joists of sufficient size to support the additional loads.

1510. **Timber Sizes.**—Sizes of floor timbers shall be as prescribed by Clause 725 (j) of this Building Manual or as specified in Chapter 19 where such is applicable, and, where necessary, joists shall have adequate side support by bridging or other means approved by an officer authorized by the Board.

1511. **Floors in Factories.**—For floors in factories, *see* Clause 2320.

CHAPTER 16.

ROOFS AND ROOF STRUCTURES.

- Clause 1601. Drainage From Roofs.
- Clause 1602. Roofs in Types 1 and 2 Construction.
- Clause 1603. Roof Coverings.
- Clause 1604. Timber in Fire-resisting Roofs.
- Clause 1605. Rooms in Roof.
- Clause 1606. Construction of Bulkheads.
- Clause 1607. Tanks.
- Clause 1608. Timber Roof Construction.

CHAPTER 16.

ROOFS AND ROOF STRUCTURES.

1601. **Drainage From Roofs.**—(a) Every roof shall be provided with a complete drainage system capable of collecting the whole of the rain water falling on such roof and discharging it to the stormwater drains required by Clause 1103, except where the Board otherwise approves.

(b) Where spouting or gutters are provided they shall be fitted with downpipes and such downpipes shall be connected to stormwater drains where such drains are available.

(c) Every spouting, gutter and downpipe shall be—

- (i) of sufficient capacity to carry all stormwater collected by it;
- (ii) of galvanized sheet iron or corrosion resistant sheet metal not less than 26 B.G. in thickness, cast iron, approved combination of cement and asbestos, concrete or reinforced concrete covered with bituminous sheeting as required for concrete flat roofs, or other materials approved by the Board;
- (iii) constructed with continuous and sharp falls to outlets in such a manner as to preclude any possibility of standing water; and
- (iv) securely fixed to eaves and/or walls.

1602. **Roofs in Types 1 and 2 Construction.**—(a) Roofs in Type 1 Construction.—Buildings of Type 1 Construction shall have flat roofs having a fire resistance rating of three hours, provided that a pitched roof not having a fire resistance rating may be constructed on any building not exceeding three stories in height.

(b) Roofs in Type 2 Construction.—Buildings of Type 2 Construction shall have flat roofs having a fire resistance rating of two hours provided that a pitched roof not having a fire resistance rating may be constructed on any building not exceeding three stories in height.

1603. **Roof Coverings.**—Every roof not required to have a fire-resistance rating, together with every flat and gutter forming part thereof, and every turret, lantern light, skylight, and other erection placed thereon, shall be externally covered with fire-retardant materials, as defined for the purpose in Clause 806, securely fixed to withstand wind loads, except that—

- (a) windows and sash frames of turrets, lantern lights, skylights, and other erections except those at the bottom of light courts may be of wood;
- (b) flat roofs shall be covered externally with galvanized or corrosion resistant sheet metal of thickness not less than 26 gauge or with two layers of approved felt and a surface covering of bituminous roofing material, or with such other materials as may be approved by an officer authorized by the Board.

1604. **Timber in Fire-resisting Roofs.**—Where timber is used for securing coverings, &c., in connexion with roofs of fire-resisting construction, the prescribed thickness of fire-resisting material shall be continuously maintained over the whole area of the roof.

1605. **Rooms in Roof.**—No habitable room shall be constructed in the roof of any building, but rooms intended for the housing of ventilating plant, lift machinery, water tanks or other equipment may be constructed in the roof provided that such rooms are limited to one story in height.

1606. **Construction of Bulkheads.**—Bulkheads or other structures over stair or lift wells on flat roofs not required to have a fire-resistance rating may be erected with walls of studding covered with corrugated galvanized iron, asbestos cement or other approved materials.

1607. **Tanks.**—(a) Tanks to contain water or other fluid placed on or above the roof of any building shall be supported on masonry structural steel or reinforced concrete, except that the seating of iron tanks may be on jarrah, or other approved hardwood not less than 2 inches in thickness.

(b) All water tanks shall be metal provided with covers of mosquito proof design.

(c) Facilities shall be provided for the cleaning out of tanks.

1608. **Timber Roof Construction.**—Sizes and spacing of roof timbers shall be as prescribed by Clause 1901.

CHAPTER 17.

CHIMNEYS, FIREPLACES, FLUES, ETC.

PART I.—GENERAL PROVISIONS.

- Clause 1701. Materials for Chimneys.
- Clause 1702. Construction of Chimneys.
- Clause 1703. Construction of Hearths.
- Clause 1704. Jambs.
- Clause 1705. Fireplace Backs.
- Clause 1706. Chimney Breasts.
- Clause 1707. Arches and Lintels.
- Clause 1708. Location of Steam-pipes, &c.
- Clause 1709. Flue Pipes for Heating Stoves and Fuel Bath Heaters.

PART II.—CHIMNEYS NOT USED FOR TRADE PURPOSES.

- Clause 1710. Height of Chimneys.
- Clause 1711. Angle of Chimneys.
- Clause 1712. Thickness of Chimney Constructed at Angle.
- Clause 1713. Soot Doors.
- Clause 1714. Rounding of Angles.
- Clause 1715. Treatment of Inside Face of Chimneys.
- Clause 1716. Plugs in Chimneys.
- Clause 1717. Timber near Chimneys.
- Clause 1718. Distance of Metal Pipes from Combustible Material.
- Clause 1719. Cutting away of Chimney Breast in Party Walls.
- Clause 1720. Flashing of Chimney Stacks.
- Clause 1721. Construction of Floors near Fuel Stoves.
- Clause 1722. Construction of Floors under Electric Stoves.
- Clause 1723. Construction near Boiler or Furnace.

PART III.—CHIMNEYS USED FOR TRADE PURPOSES.

- Clause 1724. Construction of Masonry Chimney Shaft.
- Clause 1725. Distance of Flues from Combustible Material.
- Clause 1726. Distance of Steam Pipes from Combustible Material.
- Clause 1727. Construction of Floors and Ceilings near Ovens, Boilers or Furnaces.
- Clause 1728. Construction of Walls near Ovens, Boilers or Furnaces.
- Clause 1729. Prevention of Emission of Smoke.

CHAPTER 17.

CHIMNEYS, FIREPLACES, FLUES, ETC.

Part I.—General Provisions.

1701. **Materials for Chimneys.**—Every chimney shall be constructed of—

- (a) solid masonry properly bonded; or

- (b) other suitable, good, hard, and incombustible material properly and solidly put together, approved by an officer authorized by the Board and any material which complies with the test for materials for flues, furnace casings, hearths, and similar purposes prescribed in S.A.A. Specification No. A.30.

1702. **Construction of Chimneys.**—Every chimney shall be—

- (a) built upon footing conforming to the requirements of Clause 1307; or
- (b) carried upon steel girders bearing directly upon walls having the necessary strength and stability; or
- (c) carried upon corbels of masonry, steel, concrete, or reinforced concrete, the corbelling being constructed for the full width of the jamb and projecting not more than 14 inches from the face of the wall.

1703. **Construction of Hearths.**—(a) A hearth constructed of stone, slate, bricks, tiles, cement, or other incombustible material shall be fixed under and in front of every fireplace opening.

(b) Every such hearth shall—

- (i) be solidly and securely supported;
- (ii) have a thickness of not less than 4 inches;
- (iii) extend not less than 6 inches beyond each end of the fireplace opening;
- (iv) project not less than 14 inches beyond the face of the chimney breast; and
- (v) be so solid that its surface is not lower than the floor of the room in which the hearth is situated.

1704. **Jambs.**—The jambs of every fireplace opening shall be not less than 8 inches in thickness on each side of the opening.

1705. **Fireplace Backs.**—The back of every fireplace opening from the hearth up to a height of 12 inches above the arch or lintel shall be constructed of—

- (a) solid masonry at least 8 inches thick;
- (b) reinforced concrete at least 6 inches thick; or
- (c) reinforced concrete faced with masonry or firebrick of a total thickness of 6 inches.

1706. **Chimney Breasts.**—The breast of every chimney shall be of incombustible material at least 4 inches in thickness.

1707. **Arches and Lintels.**—An arch of brick, stone, or concrete or lintel of steel or reinforced concrete of sufficient strength shall be built over the opening of every fireplace to support the breast thereof.

1708. **Location of Steam Pipes, &c.**—A pipe for conveying steam or smoke or other products of combustion shall not be fixed on any building on the face adjoining any street.

1709. **Flue Pipes for Heating Stoves and Fuel Bath Heaters.**—Flue pipes for heating stoves and fuel bath heaters shall be carried through the roof to a height of not less than 18 inches. The projecting portion of the flue pipe shall be provided with an outer casing 1 inch clear of the flue pipe commencing at the ceiling level, and terminating in an approved cowl, cap, or terminal. The outer casing shall be properly flashed at its junction with the roof.

Part II.—Chimneys Not Used For Trade Purposes.

1710. **Height of Chimneys.**—Every chimney shall be carried up at least 3 feet above the highest point at which it comes in contact with the roof of the building and at least 1 ft. 6 in. above any ridge within 10 feet of such chimney.

1711. **Angle of Chimneys.**—Chimney flues shall not be inclined at lesser angle than 45 degrees to the horizontal, except with the permission of an officer authorized by the Board, in which case approved soot doors of not less area than 40 square inches shall be provided.

1712. **Thickness of Chimney Constructed at Angle.**—When the upper side of any chimney is constructed at an angle of less than 45 degrees to the horizontal, the thickness of such upper side shall be not less than 9 inches.

1713. **Soot Doors.**—Every soot door shall be distant at least 15 inches from any woodwork.

1714. **Rounding of Angles.**—Every angle at a change of direction in a chimney flue shall be properly rounded.

1715. **Treatment of Inside Face of Chimneys.**—The inside of every chimney shall be rendered or lined with fire-resisting piping or stoneware throughout its length.

1716. **Plugs in Chimneys.**—Wooden plugs shall not be driven nearer than 3 inches or iron fastenings nearer than 2 inches to the inside of any flue or chimney opening.

1717. **Timber Near Chimneys.**—No timber shall be placed within 3 inches from the inner face of any chimney or flue.

1718. **Distance of Metal Pipes From Combustible Material.**—No metal pipe for conveying smoke or other products of combustion shall be placed nearer than 9 inches to any combustible material and any lagging used shall be of incombustible material.

1719. **Cutting Away of Chimney Breast in Party Walls.**—A chimney breast or shaft built with or in any party wall shall not be cut away unless an officer authorized by the Board certifies that it can be done without injuriously affecting the stability of any building.

1720. **Flashing of Chimney Stacks.**—Every chimney stack shall be effectively flashed at its junction with the roof.

1721. **Construction of Floors Near Fuel Stoves.**—The floor under every stove not heated by electricity, and the floor surrounding same for a space of 16 inches in front of every fire and 9 inches elsewhere, shall be formed of materials of an incombustible and non-conducting nature having a thickness of not less than 3 inches.

1722. Construction of Floors Under Electric Stoves.—The floor under any oven or stove heated by electricity shall be formed of incombustible and non-conducting materials, unless a space of not less than 6 inches is provided between the floor and the bottom of the oven of the stove.

1723. Construction Near Boiler or Furnace.—(a) Every floor or portion of a floor under or within a distance of 6 feet from a furnace shall be constructed of materials having a fire-resistance rating of one and a half hours.

(b) Every portion of a wall within a distance of 6 feet from and every portion of a floor, ceiling, or roof above and within a distance of 6 feet from any boiler or furnace shall be protected with fire-retardant materials.

(c) Where the heating unit is adequately self-insulated the provisions of sub-clause (b) hereof shall not apply.

Part III.—Chimneys Used For Trade Purposes.

1724. Construction of Masonry Chimney Shaft.—Except where computations and details of the design are submitted to and approved by an officer authorized by the Board, every chimney shaft used for the purposes of any trade or business shall be constructed of solid masonry in conformity with the following provisions:—

(a) If the shaft is detached, it shall be built with a batter from the base to the top at the rate of at least $1\frac{1}{4}$ inches in every 10 feet of height.

(b) Thickness—

(i) The thickness of the masonry at the top of the shaft and for 25 feet below the top shall be not less than 9 inches where the external dimension does not exceed 5 feet and not less than 14 inches where the external dimension is greater than 5 feet.

(ii) For the purpose of calculating the thickness of any other portion of the shaft, every 25 feet shall be at least $4\frac{1}{2}$ inches thicker than the 25 feet immediately above.

(iii) Every cap, cornice, pedestal, plinth, string course or other variation from the masonry shall be additional to the minimum thickness specified above.

(c) The least width of the base of the shaft if rectangular in shape shall be at least one-tenth of the proposed height of the shaft or if not rectangular in shape then one-twelfth of the height. The height of the shaft shall be measured from the top of the footings.

1725. Distance of Flues From Combustible Material.—No flue for conveying smoke or other products of combustion shall be placed nearer than 9 inches to any combustible materials and any lagging used shall be of incombustible material.

1726. Distance of Steam Pipes From Combustible Material.—Pipes for conveying steam or air at a temperature exceeding 212 degrees Fahrenheit shall not be fixed nearer than 6 inches to any combustible material, and any lagging used shall be of incombustible material.

1727. Construction of Floors and Ceilings Near Ovens, Boilers or Furnaces.—(a) Every floor or portion of a floor under or within 6 feet of any oven, boiler or furnace shall be constructed of materials having a fire-resistance rating of not less than three hours.

(b) Any floor, ceiling or roof or portion thereof above and within a distance of 6 feet from any oven, boiler or furnace shall be constructed of materials having a fire-resistance rating of not less than three hours.

(c) Where the heating unit is adequately self-insulated the provisions of sub-clause (b) hereof shall not apply.

1728. Construction of Walls Near Ovens, Boilers or Furnaces.—Every wall or portion of a wall within a distance of 6 feet from any oven, boiler or furnace shall be constructed of materials having a fire-resistance rating of not less than three hours.

1729. Prevention of Emission of Smoke.—(a) Every furnace and chimney shall be so used and managed as to prevent as far as possible the emission of smoke.

(b) If in the opinion of an officer authorized by the Board any furnace or chimney emits an unreasonable amount of smoke, the Board may serve notice on the owner or occupier of the land on which such furnace or chimney exists, requiring the carrying out of any alterations or additions thereto in order to minimize the emission of smoke within a time specified in such notice.

(c) Every owner or occupier served with a notice under the last preceding sub-clause shall comply therewith to the satisfaction of an officer authorized by the Board.

CHAPTER 18.

REINFORCED CONCRETE, REINFORCED BRICK MASONRY, AND STRUCTURAL STEEL DESIGN AND CONSTRUCTION.

PART I.—REINFORCED CONCRETE AND STRUCTURAL STEEL—DESIGN AND CONSTRUCTION.

- Clause 1801. Reinforced Concrete Construction.
- Clause 1802. Structural Steel Construction.
- Clause 1803. Working Stresses.
- Clause 1804. Increased Stresses in Special Concrete.
- Clause 1805. Variations from S.A.A. Codes.
- Clause 1806. Other Metal Reinforcement.
- Clause 1807. Marking of Reinforcement.
- Clause 1808. Concrete Fireproofing.
- Clause 1809. Precast Concrete Fireproofing.
- Clause 1810. Precast Concrete Units.
- Clause 1811. Reinforcement in Hydraulic Works.
- Clause 1812. Timber in Floors and Roofs of Fire-resisting Construction.

PART II.—REINFORCED BRICK MASONRY DESIGN AND CONSTRUCTION.

- Clause 1813. Working Stresses.
- Clause 1814. Method of Design.
- Clause 1815. Mortar.
- Clause 1816. Bond.
- Clause 1817. Reinforced Brick Masonry Walls.

PART III.—TESTS.

- Clause 1818. Tests.

CHAPTER 18.

REINFORCED CONCRETE, REINFORCED BRICK MASONRY, AND STRUCTURAL STEEL DESIGN AND CONSTRUCTION.

Part I.—Reinforced concrete and Structural Steel—Design and Construction.

1801. **Reinforced Concrete Construction.**—All reinforced concrete construction shall, except where prescribed to the contrary in this Building Manual, conform to the requirements of the S.A.A. Code for Concrete in Building No. C.A.2.

1802. **Structural Steel Construction.**—Except where prescribed to the contrary in this Building Manual, all structural steel construction in any building shall be designed, fabricated, and erected in accordance with the requirements of the S.A.A. Code for Structural Steel in Building No. C.A.1 and/or the S.A.A. Welding Code No. C.A.8.

1803. **Working Stresses.**—Subject to the provision of Clauses 1801 and 1802 working stresses shall not exceed in the case of—

- (a) structural steel members, the values set out in the S.A.A. Code for Structural Steel in Building No. C.A.1 Section 61;
- (b) reinforcing steel, the values set out in the S.A.A. Codes for Structural Steel in Building No. C.A.1 and for Concrete in Building No. C.A.2;
- (c) steel or iron castings, the values set out in Section 61 of S.A.A. Code for Structural Steel in Building No. C.A.1;
- (d) concrete, Grades A, B and C, the value set out for concrete in the S.A.A. Code for Concrete in Building No. C.A.2 except that where otherwise set out in Table 1803.
- (e) concrete Grade D, 400 lb. per square inch in compression.

The following permissible Stresses in Concrete may be adopted instead of stresses laid down in S.A.A. Code C.A.2:—

TABLE 1803.

Kind of Stress.	Permissible unit stress in lbs. per square inch.		
	A. <i>f_c</i> =3,000 lb. <i>n</i> =10.	B. <i>f_c</i> =2,600 lb. <i>n</i> =12.	C. <i>f_c</i> =2,200 lb. <i>n</i> =15.
Concrete (<i>see</i> Table 711 (1)).			
Flexure—			
Extreme fibre stress in compression ..	1,050	900	750
Extreme fibre stress in compression adjacent to supports of continuous or fixed beams or rigid frames	1,200	1,050	880
Shear—			
Beams with anchorage of longitudinal steel but with no web reinforcement.. ..	60	50	40
Beams with anchorage of longitudinal steel and with properly designed web reinforcement	180	150	120
Flat slabs at distance "D" from edge of column cap or drop panel	90	75	60
Footings where longitudinal bars have anchorage	60	50	40
(Footing shear area may be taken as a plane extending at 45° outwards from edge of bearing instead of a vertical plane at edge of bearing.)			
Bond (with anchorage of longitudinal steel) in beams, slabs and footings—			
Plain bars	110	100	90
Deformed bars	130	120	110
Bearing—			
Where a member rests on a concrete pier, pedestal or block, the area of which is at least 10 per cent. greater than the area in bearing the allowable bearing stress may be	750	650	550
Axial Compression—			
In columns with lateral ties or ligatures ..	675	600	500
In columns with continuous spirals a special formula is to be used. (<i>See</i> S.A.A. Code C.A. 2, Clause 127.)			

NOTE.—*f_c* = Ultimate compressive strength of concrete at age of 28 days.

1804. **Increased Stresses in Special Concrete.**—The permissible working stresses in Concrete under this Building Manual may be increased to those shown in Table 1804 when the following conditions (a), (b), (c), (d), in addition to those elsewhere prescribed are fulfilled:—

- (a) The work shall be designed by a qualified Engineer having at least seven years experience in the design and construction of important structural, architectural and engineering work;
- (b) The work shall be carried out under the responsible and continuous supervision of a qualified engineer who shall be present during the whole time concrete is being mixed and placed;
- (c) The following tests and determinations of all concrete materials shall be carried out by the designer and the results submitted to an officer authorized by the Board:—
 - (i) standard physical and chemical tests including the determination by grading tests of the optimum proportions of fine and coarse aggregates corresponding to the normal proportions specified, at weekly intervals or whenever the source of supply or grading is altered;
 - (ii) the amount of water required to give the minimum slump compatible with suitable workability at daily intervals or whenever there is a change in the water content or characteristics of the aggregates.

(The amount of water so determined shall be accurately measured and added to each batch of concrete.)

- (d) Approved power vibration of not less than 4,000 impulses per minute shall be used for consolidating concrete in position. (Care shall be taken not to touch the reinforced steel with the vibrators. Vibration shall be applied for short periods at closely spaced points and excessive vibration at any one point shall be avoided.)

TABLE 1804.

Permissible Stresses in Special Concrete.

Kind of Stress.	Permissible unit stress in lbs. per square inch.		
	A. $f_c=3,750$ lb. $n=10$.	B. $f_c=3,250$ lb. $n=10$.	C. $f_c=2,750$ lb. $n=12$.
Special Concrete (<i>see</i> Table 711 (1)).			
Flexure—			
Extreme fibre stress in compression ..	1,200	1,050	900
Extreme fibre stress in compression adjacent to support of continuous or fixed beams or of rigid frames	1,350	1,200	1,050

Kind of Stress.	Permissible unit stress in lbs. per square inch.		
	A. $f_c=3,750$ lb. $n=10$.	B. $f_c=3,250$ lb. $n=10$.	C. $f_c=2,750$ lb. $n=12$.
Special Concrete (<i>see</i> Table 711 (1)).			
Shear—			
Beams with anchorage of longitudinal steel but with no web reinforcement ..	70	60	50
Beams with anchorage of longitudinal steel and with properly designed web reinforcement	200	170	140
Flat slabs at distance "D" from edge of column cap or drop panel	105	90	75
Footings where longitudinal bars have anchorage (Footings shear area may be taken as a plane extending at 45° outwards from edge of bearing instead of a vertical plane at edge of bearing.)	70	60	50
Bond (with anchorage of longitudinal steel) in beams and slabs and footings—			
Plain bars	120	110	100
Deformed bars	140	130	120
Bearing—			
Where a member rests on a concrete pier, pedestal or block, the area of which is at least 10 per cent. greater than the area in bearing, the allowable bearing stress may be	950	800	700
Axial Compression—			
In columns with lateral ties or ligatures ..	800	700	600
In columns with continuous spirals a special formula is to be used. (<i>See</i> Clause 127 of S.A.A. Code C.A. 2.)			

NOTE.— f_c = Ultimate compressive strength of concrete at age of 28 days.

1805. **Variations from S.A.A. Codes.**—The following variations from the S.A.A. Codes shall be adopted under this Building Manual:—

- (a) In computing the resistance to negative moments at supports of T Beams the area of steel in compression shall in no case be taken as exceeding 3 per cent. of the area of the web of the T beam below the slab.
- (b) In computing the safe load on reinforced concrete columns with longitudinal reinforcement and lateral ties, no longitudinal reinforcing steel in excess of 4 per cent. of the total area of the column may be taken into account. (In all reinforced concrete columns when the total amount of the longitudinal reinforcement exceeds 2 per cent. of the area of the column taken into account as carrying load, lapped joints in the reinforcement will not be permitted and a direct method must be used for transferring the load from the upper reinforcing bars to the lower. The lateral ties shall provide for a shearing force equal to $2\frac{1}{2}$ per cent. of the load carried by the vertical reinforcement.)

- (c) When bending stress has to be added to direct load stress in columns, the permissible unit stress in compression may be increased to $0.35 f_c$ provided that in no case shall any part of the column be less than would be required if the bending moments were omitted.
- (d) The increase in deflection of beams, as working stresses are increased, should be noted and excessive deflections and creep should be avoided. (In every reinforced concrete beam, the ratio of depth to span shall be so proportioned that the deflection under full load will not exceed $1/2000$ th the span.)
- (e) When more than one layer of bars in tension is provided in planes parallel to the plane of the neutral axis of a beam then the average stress in the bars will be accepted as determining the maximum permissible stress provided that the actual average stress in the lower layer of bars must not exceed the average stress in the whole of the bars by more than 10 per cent. When more than one layer of bars is provided in a beam the clear vertical distance between layers of bars shall be not less than 1 inch for round bars and $1\frac{1}{2}$ inch for square bars.
- (f) When structural steel beams are encased in concrete in accordance with the requirements for a four-hour fire-resistance rating, the permissible stresses in the extreme fibres under bending moment may be increased to 20,000 lbs., per square inch.
- (g) Only those connexions of structural steel members which it is impracticable to make in the workshop may be made on the site. In addition to these cases named in the S.A.A. Code C.A.1 for connexions, black bolts not less than $\frac{3}{4}$ inches diameter may also be used in all places not subject to direct shearing forces, e.g., top connecting cleats of rolled steel joists and attachments of rolled steel joists to seating brackets.
- (h) The eccentricity of any load applied by a structural steel member to a bracket attached to a column shall be considered equal to the distance from the centroid of the column to the face on which the bracket is attached, plus one-tenth inch per ton of such load or plus one $\frac{1}{4}$ -inch whichever is the greater. (For the eccentricity of any load applied to a column by a steel beam supported on the top of the column the difference in shear at the two opposite faces of the column shall be taken as the eccentric load, and the eccentric arm shall be considered as three-eighths the distance between the column faces.)
- (i) In the design of steel-frame buildings the end fixity of the beams may be taken into account when joints are constructed and bending moments determined in accordance with the Code of Recommendations given in the Final Report of the Steel Structures Research Committee, 1936, of the British Depart-

ment of Scientific and Industrial Research, and in welded joints fixity of beams shall be taken into account as set out in S.A.A. Welding Code, No. C.A.8.

- (j) Where one end of a structural steel column is restrained in direction and held in position and the other end is neither restrained in direction nor held in position, the effective length of the column shall be taken as twice the actual length.
- (k) For the purpose of rating in terms of fire resistance, cover over reinforcement in concrete shall not be less than as specified in Chapter 8.
- (l) **Combination Columns—**
 - (i) a combination column shall consist of a number of structural steel sections placed diagonally or batted together to form a structural steel column, the space between the sections being filled with concrete, the column wrapped with wire or an approved equivalent as required for structural steel columns encased in concrete, and the sections covered with concrete at least 2 inches thick except over rivet heads. (The structural steel portions shall be connected at joints in accordance with the provisions of this Manual governing joints in structural steel.);
 - (ii) flanged joints may be used in the structural steel portion when the column is entirely under compressive stress provided all butting ends are machine faced, the connexion is capable of transmitting a force at least equal to 20 per cent. of the load on the upper column and the flanges are symmetrically arranged and connected on the four faces of the column;
 - (iii) special brackets shall be used to receive the entire floor load at each story;
 - (iv) the permissible load on a combination column shall be equal to 0.25 f_c or the area of the concrete inside the lacing or batten plates plus the permissible load on similar structural steel as in a composite column as defined in the S.A.A. Code for Concrete Building No. C.A.2.
- (m) **In simple beams or freely supported end spans of continuous beams anchorage shall be provided—**
 - (i) by extending, without bending, not less than one-half of the maximum tensile reinforcement beyond the face of the support to provide a straight embedment of not less than five diameters with a plain or embracing hook in addition; or
 - (ii) by extending a similar amount of reinforcement beyond the face of the support and then bending the bars in the direction of the depth of the beam, away from the bearing surface of the support. (In this case the length of embedment shall be not less than fifteen diameters plus a plain or embracing hook.);

- (iii) for indented bars or bars providing a satisfactory mechanical bond the plain or embracing hook prescribed in paragraph (i) and (ii) may be omitted provided that in case (i) the straight embedment shall not be less than ten diameters. (In continuous or cantilever beams each bar of the negative tensile reinforcement shall be extended, without bending, beyond the face of each support to provide a straight embedment of not less than 40 diameters plus a plain hook. Not less than one-third of the area of the negative reinforcement shall be extended six diameters beyond the point of inflection and each bar shall have a plain hook in addition. In the case of deformed bars or bars providing a satisfactory mechanical bond the plain hook may be omitted.)
- (n) Except at splices, parallel bars shall be spaced so that the horizontal distance between any two bars shall not be less than $1\frac{1}{2}$ times the diameter of the larger of the two bars, and the vertical distance between any two bars shall not be less than the diameter of the larger bar subject to the further requirement that in no case shall the distance between parallel bars be less than the size of the largest piece of aggregate used, plus $\frac{1}{4}$ inch.
- (o) Where steel reinforcement is introduced in beams and slabs to provide for shearing forces such reinforcement shall be capable of taking any excess shear not provided for by the concrete, but where the concrete is not capable of providing for more than two-thirds of the total shear then the steel shear reinforcement must be capable of providing for the whole of the shear.
- (p) The temporary supports for reinforcing bars in forms shall not be spaced closer than 100 diameters, and bars placed near the top of beams shall have the supports removed after concreting to allow the bars to follow shrinkage movements in the setting concrete.

1806. Other Metal Reinforcement.—Metal reinforcement, other than that as permitted elsewhere in this Building Manual, may be used with the approval of, and under such conditions as may be required by, an officer authorized by the Board.

1807. Marking of Reinforcement.—Metal reinforcement used in any construction work shall be suitably marked for the purpose of identification.

1808. Concrete Fireproofing.—Where the thickness of concrete fireproofing on the soffit of steel beams and girders is less than one-twelfth of the width of the bottom flange plus $1\frac{1}{2}$ inches, such fireproofing shall be—

- (a) rammed in from the side, the bottom of the side forms being made removable for the purpose; or
- (b) of precast concrete.

1809. Precast Concrete Fireproofing.—Precast concrete for fireproofing shall have rebated or interlocking joints and sufficient projecting rods or wires to ensure adequate bond to concrete placed in situ. The space between the steel and precast concrete shall be filled with concrete.

1810. Precast Concrete Units.—The use of precast reinforced concrete units shall be permitted in the construction of floors and other suitable portions of buildings subject to compliance with the provisions of this Building Manual in regard to—

- (i) quality of materials;
- (ii) loading and stresses on the materials; and
- (iii) workmanship,

if it be shown that the building has the necessary strength and stability.

The stress limitations prescribed in this Building Manual shall not apply to precast reinforced concrete units where the following requirements are complied with:—

- (i) The units shall be manufactured under approved factory conditions and competent engineering control and be branded with a permanent identification mark of the manufacturer;
- (ii) Proper testing facilities shall be provided for testing units;
- (iii) At the age of delivery, the units shall be capable of sustaining, without damage, a superimposed test load calculated as half the dead load plus one and one-half times the live load;
- (iv) Test shall be carried out by the manufacturer in the presence of an officer authorized by the Board when so required.

Up to 10 per cent. of the units shall if required be tested to the loading prescribed in the preceding paragraph and shall all pass this test. In addition 1 per cent. shall if required be tested to the point beyond which the unit will sustain no further load. In this case the load at failure shall not be less than two and one-half times the design load, consisting of dead load plus live load. Specimens for test shall be selected by an officer authorized by the Board. Failure to pass these tests shall cause rejection of the batch of units represented by the test.

1811. Reinforcement in Hydraulic Works.—In hydraulic works the tensile stress in the reinforcement must be reduced sufficiently to keep cracks in the concrete within the limits required for water tightness.

1812. Timber in Floors and Roofs of Fire-resisting Construction.—Timber may be used in floors of fire-resisting construction for the construction or securing of floor or ceiling coverings provided that the prescribed thickness of fire resisting material is maintained throughout the whole area of the floor. (See also Clause 804 (c) and 2004 (c).) For use of timber in roofs of fire-resisting construction see Clause 1604.

CHAPTER 19.

TIMBER BUILDINGS AND CONSTRUCTION.

- Clause 1901. Framework.
- Clause 1902. Support of Framework.
- Clause 1903. Ventilation under Wood Floors.
- Clause 1904. Termite Proofing.
- Clause 1905. Vermin Plates.
- Clause 1906. External Covering for Walls.
- Clause 1907. Distance of Timber Walls from Boundary.
- Clause 1908. Lining of Walls and Ceilings.
- Clause 1909. Re-erection of Removed Buildings.

CHAPTER 19.

TIMBER BUILDINGS AND CONSTRUCTION.

1901. Framework.—The framework of every timber building shall be constructed as follows:—

- (i) For buildings of Class I., II., III., and IV. Occupancy in accordance with S.A.A. No. 0.56 “Dimensions of Structural Timbers for use in Domestic Building Construction”.
- (ii) For other buildings—in accordance with the recommendations set out for Class I. Construction in the latest edition of “Building Frames” (Timbers and Sizes), being pamphlet No. 112 issued by the Commonwealth Scientific and Industrial Research Organization provided that—
 - (a) temporary buildings may be constructed in accordance with the recommendations set out for Class II. Construction in the said pamphlet No. 112;
 - (b) where it is desired to use materials, methods, sizes and/or spacings other than as prescribed herein, or where in any particular case the said recommendations are inapplicable or the sizes unsuitable, computations and details shall be submitted to and the design approved by an officer authorized by the Board.

1902. Support of Framework.—The framework of walls shall rest upon—

- (a) sleeper walls of masonry or concrete not less than 4 inches in thickness, stiffened under bearers with piers not less than 8 inches in width and 4 inches thicker than and bonded into the sleeper walls;
- (b) piers of masonry measuring not less than 9 inches by 9 inches or of concrete measuring not less than 9 inches in diameter provided that any concrete stump which exceeds in height six times its least dimensions shall be reinforced

to the approval of an officer authorized by the Board. All foundation piers shall be set at a depth below the natural ground surface equal to one-fifth of the length of the pier, but in any case at no less depth than 15 inches;

- (c) piers of any other material which may be approved by an officer authorized by the Board.

1903. Ventilation Under Wood Floors.—For clauses relating to the ventilation of wood floors, *see* Clauses 1508 and 1812.

1904. Termite Proofing.—(a) Where the framework of walls is supported upon sleeper walls or foundation piers, such walls or piers shall be fitted with approved metal termite resisting slips or caps respectively, projecting at least 2 inches beyond the vertical face or faces of the support and turned down at an angle of 45 degrees at all free edges; at all salient and re-entrant angles the termite slips and/or caps shall be properly mitred and soldered.

(b) Except with the written authority of an officer authorized by the Board, the placing of timbers on or in the ground will not be permitted.

1905. Vermin Plates.—Termite-resisting construction shall be provided in all timber construction.

1906. External Covering for Walls.—Walls shall be covered externally with—

- (a) weatherboards—
 - (i) not less than 9/16 inch in thickness; or
 - (ii) tapered from a thickness of not less than $\frac{3}{4}$ inch to a thickness of not less than $\frac{1}{4}$ inch;
- (b) asbestos cement not less than 3/16 inch in thickness;
- (c) other durable materials having a satisfactory resistance to the penetration of moisture and approved by an officer authorized by the Board.

Wall surfaces may consist of wooden, metal, glass or asbestos cement louvres, either fixed or adjustable.

1907. Distance of Timber Walls from Boundary.—Timber walls shall not be constructed within 6 feet of the boundary of any allotment not in the same occupation.

1908. Lining of Walls and Ceilings.—(a) The internal lining of all walls and ceilings of timber buildings of Classes I, II, III, and IV. Occupancy shall be of lath and plaster or approved expanded metal and plaster finished to a hard surface, plaster sheets, asbestos cement sheets, or other durable materials, but lining of textile materials and/or paper shall not be permitted; or

(b) Internal wall surfaces may consist of louvres as for external walls, except that bathrooms and privies shall be constructed in such a way that the lower 5 feet of all walls shall be closed to the satisfaction of an officer authorized by the Board.

1909. Re-erection of Removed Buildings.—Every building or erection removed shall, when re-erected, comply with all the provisions of this Building Manual relating to new buildings of the appropriate class of occupancy and type of construction.

CHAPTER 20.

MEANS OF EGRESS.

- Clause 2001. Application.
- Clause 2002. Relation of Population to Exits.
- Clause 2003. Kinds of Exits.
- Clause 2004. Fire-isolated Stairs.
- Clause 2005. Location of Exits.
- Clause 2006. Exits From Buildings of Classes I, II, III, and IV. Occupancy.
- Clause 2007. Exits From Buildings of Classes V., VI., VII, and VIII. Occupancy.
- Clause 2008. Stairways Discharging on to Floor Above Street Level.
- Clause 2009. Changes in Width of Exits.
- Clause 2010. Construction of Stairs.
- Clause 2011. Landings.
- Clause 2012. Guards and Handrails.
- Clause 2013. Measurement of Width.
- Clause 2014. Space Under Stairs.
- Clause 2015. Enclosing Walls.
- Clause 2016. Ramps.
- Clause 2017. Horizontal Exits.
- Clause 2018. Gangways.
- Clause 2019. Height of Exits.
- Clause 2020. Aisles and Passages.
- Clause 2021. Doorways.
- Clause 2022. Revolving Doors.
- Clause 2023. Door Fastenings.
- Clause 2024. Maintenance of Exits.
- Clause 2025. Lighting and Ventilation of Exits.

CHAPTER 20.

MEANS OF EGRESS.

2001. **Application.**—(a) Every building other than a public building shall be provided with exits in accordance with the provisions of this Chapter.

(b) Every public building shall be provided with exits as the Board, in its discretion, shall prescribe as necessary for such building.

2002. **Relation of Population to Exits.**—(a) When the number of persons for whom egress space is to be provided is not stated in the applica-

tion for a building permit, it shall be ascertained by applying to the space available for occupation the following areas per person:—

	Sq. Ft.
Concert rooms and meeting halls provided with seating accommodation	5
Dance halls	8
Restaurants	12
School rooms	15
Shops and markets—	
(1) Ground floors	40
(2) Other floors	60
Offices and Showrooms	100
Warehouses, bulk stores, public garages and motor show-rooms	300
	Cu. Ft.
Factories (excluding any space more than 13 feet from the floor)	400

(b) For any occupancy not specified in sub-clause (a) an officer authorized by the Board shall determine the scale to be used.

2003. **Kinds of Exits.**—For the purpose of this Chapter, exits shall consist of stairs, ramps, horizontal exits, passageways and doorways used either singly or in association to provide the necessary passage to a street or to an open space leading to a street.

2004. **Fire-isolated Stairs.**—(a) When a stairway is required to be fire-isolated, the walls, ceilings, floors and doors shall be so constructed as to provide complete enclosure of the stairway from the room or space served to the exterior of the building provided that—

- (i) a stairway need not be enclosed on the uppermost story, except where it is the only means of exit from such story or where it provides access to the roof of the building;
- (ii) where a stairway is not enclosed on the uppermost story a solid balustrading of incombustible material shall be constructed on such story to a height of 3 feet above the level of the floor.

(b) Such walls, floors and ceilings shall have a fire-resistance rating of two hours, provided that in Type 1 Construction the requirements of Clause 2005 shall be observed.

(c) The fire-resistance rating of any ceiling shall mean that of such ceiling in association with any floor or roof construction immediately above it, and the rating of any floor shall mean that of such floor in association with any ceiling beneath it. (*See also Clause 1812.*)

(d) When an exit or any part thereof is required to have a minimum fire-resistance rating, then all construction which supports such exit or part thereof and which transfers its live and dead loads to the ground shall have a rating at least equal to that of the exit in portion thereof supported.

(e) When any exit stairway leading from an upper floor to an exit from the building is continued past the level of such exit to provide access to any lower floor, such continuation shall be assumed to be part of such exit stairway, and shall be fire-isolated if the exit stairway is required to be fire-isolated.

(f) Openings in enclosing walls of fire-isolated stairways shall conform to the requirements of Clause 2104, except that doors opening on to a street or exterior passageway and not required to be protected pursuant to Clause 2007 shall not be required to have a fire-resistance rating.

(g) Where a fire-isolated stairway is required by this Building Manual, an external stairway may be substituted therefor. *See* also Clauses 805, 2010, 2021 (e) and 2104.

2005. Location of Exits.—(a) Except as provided in sub-clause (b) hereof, exits shall be so located that no point in a floor area, room, or space served by them is distant from an exit more than—

(i) in unsprinklered buildings of high hazard occupancy—80 feet; in sprinklered buildings of high hazard occupancy—100 feet;

(ii) in unsprinklered buildings not having a high hazard occupancy—100 feet; in sprinklered buildings not having a high hazard occupancy—150 feet.

(b) The distance shall be measured from the most remote point to the exit except that where a building not having a high hazard occupancy is divided into rooms or apartments as in offices or residential buildings the distance shall be measured from the corridor entrance of such rooms to the nearest exit.

(c) In buildings of Types 3, 4 and 5 Construction, exits shall be so arranged that there are no pockets or dead ends in which the occupants may be trapped.

(d) All exits shall be as far apart as practicable and when more than one exit is required, they shall be distributed as uniformly as possible within or around the floor area, or space they are to serve.

2006. Exits From Buildings of Classes I., II., III. and IV. Occupancy.—

(a) From rooms: Every room intended for more than 80 persons shall have at least two doorways remote from each other.

(b) From buildings: Every building containing more than one story above the ground story shall have alternative exits, one of which shall be a fire-isolated stairway. Additional means of exit shall be provided where the distance of travel exceeds the limit prescribed by Clause 2005. Where more than three stairways are required by this Building Manual, at least two shall be fire-isolated and where more than six stairways are required at least three shall be fire-isolated. In a building of less than two stories above ground level an alternative exit shall be provided if, in the opinion of an officer authorized by the Board, such building constitutes a fire risk.

(c) From basement: Except in a building of Class I. Occupancy, every basement area shall have a direct access to at least two independent exits, one of which shall be fire-isolated, provided that where any such basement is used solely for the housing of mechanical equipment, the non-fire-isolated exit may be in the form of a fixed ladder or steep stair.

(d) Every exit shall have a minimum width of 3 ft. 4in. except that in buildings of Class I. and Class IV. Occupancy, and in buildings of Class II. Occupancy containing not more than four flats, the minimum width may be reduced to 2 ft. 8 in.

(e) In the case of small types of Class I. Occupancy, one exit stairway suitably located may be permitted by an officer authorized by the Board.

2007. Exits from Buildings of Classes V., VI., VII. and VIII. Occupancy.

—(a) Every building containing Class V., VI., VII. or VIII. Occupancy shall have exits in accordance with the following requirements:—

- (i) Every such building not more than two stories in height shall be provided with alternative means of escape or with a fire-isolated stairway;
- (ii) Every such building more than two stories in height shall be provided with alternative means of escape, one or more of which shall be a fire-isolated stairway except that in a building of Type 1 or 2 Construction and not more than three stories in height alternative means of escape shall not be required where the fire-isolated stair has no communication with the ground floor.

(b) Additional means of exit shall be provided where the distance of travel exceeds the limits prescribed by Clause 2005.

(c) Where more than three stairways are required by this Building Manual at least two shall be fire-isolated, and where more than six stairways are required at least three shall be fire-isolated.

(d) Every basement area shall have direct access to at least two independent exits, one of which shall be fire-isolated, provided that where any such basement is used solely for the housing of mechanical equipment, the non-fire-isolated exit may be in the form of a fixed ladder or steep stairs.

(e) Width of Exits.—The aggregate width of exits serving any floor area shall be sufficient to provide for the number of persons accommodated in that area on the basis of 20 inches of width per twenty persons, or part thereof, provided that—

- (i) in a building of Type 1 or Type 2 Construction having alternative means of escape the number of persons per 20 inches of exit width may be increased to 25;
- (ii) for each fire-isolated stair provided in addition to those required by this Building Manual, the number of persons per 20 inches of exit width may be further increased by 25 per cent.;
- (iii) in a building not more than two stories in height the number of persons per 20 inches of exit width may be further increased by 25 per cent.;
- (iv) every exit shall have a minimum width of 3 ft. 4 in. except that a stair serving a floor area accommodating not more than 25 persons may be reduced to 2 ft. 8 in. in width;
- (v) the width of any stairway in excess of 5 feet shall not be regarded as part of the aggregate width required by this Building Manual.

2008. Stairways Discharging on to Floor Above Street Level.—In buildings of Class III., V. and VI. Occupancy a stairway serving upper floors and not required to be fire-isolated may discharge on to a floor area not more than 15 feet above the level of the street at the entrance thereto provided that an unobstructed aisle at least as wide as such stairway is maintained free from such stairway to an exit from the building.

2009. Changes in Width of Exits.—No means of exist shall decrease in width in the direction of exit travel.

2010. Construction of Stairs.—(a) **Material.**—Except in buildings of Class I. Occupancy, every stair and landing shall be constructed of fire-resisting materials as defined in Clause 801, provided that in the case of buildings exceeding three stories in height, external stairs shall be constructed of metal not less than $\frac{1}{4}$ inch in thickness or of reinforced concrete.

(b) **Winders.**—The use of winders is prohibited in exit stairways, except in buildings of Class I. and Class IV. Occupancy.

(c) **Geometric Stairs.**—In all classes of buildings the use of geometric stairs may be permitted on condition that—

(i) the centre of curvature is outside the outer string and at a minimum distance therefrom equal to at least two-thirds of the width of the stair; and

(ii) the width of treads exclusive of nosing or overhang is 11 inches measured at a distance of 20 inches from the inside face of the shortest string.

(d) **Treads and Risers**—

(i) treads and risers shall be of uniform width;

(ii) treads shall have a width of not less than 10 inches (exclusive of nosing) and risers shall have a height of not more than $7\frac{1}{2}$ inches, except that in stairs not required to be fire-isolated in buildings of Classes I., II., III., IV., V. and VII. Occupancy and in stairs to mezzanine floors the width of treads may be not less than $9\frac{1}{2}$ inches and the risers not more than 8 inches;

(iii) treads and landings may be solid and shall be so constructed as to prevent persons slipping thereon.

(e) **Head Room.**—Every stairway shall have a head room clearance of not less than 6 ft. 8 in. measured vertically above any landing or above a line connecting the stair treads.

(f) **Lining.**—The lining, if any, of the spandrels and of the underside of stairs and landings shall be constructed of materials as specified in Clause 805 (b). The underside of all internal stairs shall be so lined unless risers are fitted.

2011. Landings.—(a) Stairs to be in straight flights—Except in winders or geometric stairs, every stair shall have straight flights with half space or quarter space landing at intervals of not more than sixteen or less than two risers, but no stair shall have more than 32 successive risers, whether in two or more flights, without a change of direction through at least 60 degrees.

(b) The length and width of landings shall be not less than the width of stairways on which they occur, except that in a straight flight the distance between the risers on a landing may not be less than 36 inches.

2012. Guards and Handrails.—(a) Every stairway shall have a wall or a well-secured balustrade or guard on each side.

(b) Every stairway when 40 inches or less in width shall have handrails on at least one side, and when more than 40 inches in width, shall have handrails on both sides.

(c) When the width of a stairway of more than eight risers is 80 inches or more, one or more intermediate handrails continuous between landings shall be provided, the number and positions of intermediate handrails being such that there shall be not more than 60 inches between handrails.

(d) Handrails shall be fixed at a vertical height of not less than 34 inches above the nosing of the tread and not less than 36 inches above the landing, and shall be so constructed that there will be no obstruction on or above them tending to break a handhold.

(e) Every external stairway and its landings and platforms shall be fitted with a handrail and an intermediate rail, on its opening side.

2013. Measurement of Width.—The width of stairs shall be measured—

- (a) when the stairs are enclosed on each side with walls, between the finished surfaces of the walls;
- (b) when a stair has a wall on one side only, between the finished surface of the wall and the inner side of the balustrade;
- (c) when balustrades are provided on both sides, between the inner surfaces of the balustrades.

2014. Space under Stairs.—Except in the case of stairs in a building of Class I, II, III, or IV. Occupancy the space under stairs shall be left entirely open or shall be entirely enclosed without openings thereto.

2015. Enclosing Walls.—All walls and partitions enclosing non fire-isolated stairs shall be covered with fire-retardant materials as defined in Clause 806.

2016. Ramps.—(a) Ramps may be substituted for stairways provided they conform to such of the requirements of this Chapter for stairways as are applicable.

(b) Ramps shall be in straight lengths with a landing at each change of direction having a length and a width at least equal to the width of the ramp, and each ramp between buildings shall be uniform in grading.

(c) Ramps serving as exits or giving access to exits shall have a slope not greater than one in eight.

(d) Ramps used for purposes other than exit travel shall not be limited as to gradient.

(e) Ramps shall be provided with an approved non-slip surface.

(f) Outgoing car ramps from buildings shall be so located as to provide a section at least 12 feet long between the end of the ramp and the exit at the street alignment, the grade of such section being not more than one in fifteen.

2017. Horizontal Exits.—(a) Definition.—A horizontal exist shall mean the connexion by a bridge, balcony, vestibule or doorway of two floor areas at substantially the same level, such floor areas being located in the same building and entirely separated from each other by construction having a fire resistance rating of two hours.

(b) Clear Width of Parts.—When vestibules, open air balconies, or bridges are used as parts of any horizontal exit, they shall be constructed of fire-resisting material and their clear width shall be at least as great as that of the total width of the exit doorways opening into them, except that handrails may project into this clear width not more than 4 inches.

(c) **Gradients.**—In any horizontal exit where there is a difference in level between the connecting floor areas, gradients shall not exceed those specified in Clause 2016 (c) for ramps. Stairs or steps shall not be used in a horizontal exit in conjunction with a gradient.

(d) **Doors.**—Every opening used in connexion with a horizontal exit shall be protected by a two-hour fire door provided that—

- (a) when located in a fire wall there shall be a two-hour fire door on each side of the wall, if practicable a vestibule being provided on one side thereof;
- (ii) no locks or fastenings shall be placed on such doors that would prevent them from being opened from either side; (*See* also Clause 807.)

(e) **Exits.**—There shall be at least one exit accessible to or from the space on each side of a horizontal exit.

2018. **Gangways.**—Gangways or bridges may with the consent of the Board be erected over private lanes or rights-of-way to connect buildings in the one occupation provided that such gangways shall be constructed of fire-resisting materials, and, in the case of enclosed gangways, doors shall comply with the following requirements:—

- (i) Doorways shall not exceed 56 square feet.
- (ii) Doorways shall be protected with 2-hour fire-resisting doors complying with the requirements of Clause 807.
- (iii) Such doors shall be hung so as not to obstruct the egress space of the landings or passages.

2019. **Height of Exits.**—Exits shall have a minimum height of 6 ft. 8 in. throughout.

2020. **Aisles and Passages.**—Access shall be provided to the exits from each floor by means of continuous aisles or passageways which shall—

- (a) be so arranged that the occupants of every compartment shall have convenient access at all times to every exit leading from the floor on which such compartment occurs;
- (b) have an aggregate width at least equal to the width required for the exit to which such aisles or passageways discharge, but in no case less than 2 ft. 8 in.;
- (c) be of a height throughout of not less than 7 ft. 6 in. except that where such aisles or passages pass under stairs their height may be reduced to 6 ft. 8 in.

2021. **Doorways.**—(a) **Hanging of Doors.**—The doors of exit doorways shall be so hung and arranged that when open they shall not diminish or obstruct the required width of the doorway, passageway, hallway, stairway or other means of exit. Swinging doors in their swing shall not reduce the effective width of stairways, or landings to less than 20 inches nor shall they reduce the effective width of a passageway or hallway to less than the minimum width required.

(b) All doors in exit doorways shall open in the direction of exit travel, excepting doors in buildings of Class I., II., or IV. Occupancy, and doors

servicing only a ground floor area of not more than 1,500 square feet, provided that this requirement shall not prohibit the use of doors swinging both inwards and outwards.

(c) Doors abutting on a street shall be recessed so as not to encroach on the public way, or they may open inwards provided they be locked back in such a manner as to require a key to release them.

(d) Except in the case of a door the sill of which is not more than 2 feet above ground level, no exit door shall open immediately on to a flight of stairs, but shall open on to a landing of which the width shall be not less than the width of the door and the length in the direction of travel shall not be less than 3 feet or half the width of the door, whichever shall be the greater, provided that in no case shall the width of a landing when at right angles to the direction of travel be less than the width of the stair required by this Chapter.

(e) Doors to fire-isolated stairways shall be self-closing except that any such door may be kept open by an approved fusible link, provided that an additional self-closing door constructed of hardwood not less than 1½ inch in thickness or other material having equivalent fire-resisting qualities is fitted in the opening in such a manner as to cause no obstruction to the stairway when opened, and provided further that any glazing in such additional self-closing door shall be fire-resisting and shall not exceed in area 30 per cent. of the area of the door. *See also Clause 2104.*

2022. Revolving Doors.—Revolving doors may be used only in doorways giving direct access to a street but in no case shall a revolving door form part of a means of exit required by this Building Manual.

2023. Door Fastenings.—(a) Fastenings on any required exit door shall be such that the door may be readily opened from the inside without the use of keys.

(b) Fastenings on Doors across Passages.—No fastenings shall be used on a door across a passage except such as will allow the door to be instantly opened from either side without a key or other special appliance.

(c) Fastenings to be in Order.—All fastenings shall be maintained in good working order and state of repair.

(d) Prohibition of Obstructions on Doors.—No door guard, catch, lock, handle door pull or other similar appliance shall be affixed to the door of any exit so that when the door is in the fully opened position such appliance projects and to any extent obstructs the exit.

2024. Maintenance of Exits.—All exits shall be maintained in an efficient condition and shall at all times during occupancy of the building be kept readily accessible and clear of obstructions.

2025. Lighting and Ventilation of Exits.—Every stairway or other means of exit and corridors and passageways appurtenant thereto shall be effectively ventilated and artificially lighted. The lighting circuit shall be a separate one controlled from the stair enclosure, and shall be continuously in operation while the building is occupied, provided that in buildings of Class I., II., and IV., Occupancy, where a stair serves one dwelling only a separate lighting circuit shall not be required. *See also Chapter 6.*

CHAPTER 21.

FIRE PROTECTION OF OPENINGS.

- Clause 2101. Doorways in Party Structures.
- Clause 2102. Windows in Party Structures.
- Clause 2103. Openings in Fire Walls.
- Clause 2104. Openings in Walls of Fire-isolated Stairways.
- Clause 2105. Openings Near External Fire-isolated Stairways.
- Clause 2106. Doorways of Lift Shafts.
- Clause 2107. Openings in External Walls.
- Clause 2108. Openings Overlooking Flat Roof.
- Clause 2109. Skylights in Courts.
- Clause 2110. Openings Connecting Dwelling with Trade Building.
- Clause 2111. References.

CHAPTER 21.

FIRE PROTECTION OF OPENINGS.

2101. **Doorways in Party Structures.**—Doorways will be permitted in party structures provided that—

- (a) such doorways open on to staircase landings of passageways;
- (b) the net area of each of such doorways shall not exceed 56 square feet without the express permission of an officer authorized by the Board;
- (c) the total width of such openings in any one story shall not exceed 50 per cent. of the length of the wall;
- (d) such doorways are protected with fire doors hung in such a manner as not to obstruct the landings or passageways and having a fire-resistance rating of two hours. *See* also Clause 807.

2102. **Windows in Party Structures.**—Glazed openings in party structures will be permitted provided that—

- (a) such openings are provided with two-hour fire windows;
- (b) no such opening exceeds 15 square feet in area;
- (c) the glazing in each opening is divided into panels not exceeding 5 square feet in area; and
- (d) the total area of the openings in any one story does not exceed 20 per cent. of the area of the wall in that story. *See* also Clause 808.

2103. **Openings in Fire Walls.**—(a) Where fire walls are required to limit the floor area of a building as prescribed in Clause 2206, openings will be permitted in such walls provided that the net area of any such openings shall not exceed 56 square feet except in sprinklered buildings where the opening may be 80 square feet in area. The width of such opening or openings shall not exceed one-half of the length of the wall in which they occur.

(b) Where openings larger than those permitted by sub-clause (a) of this clause are essential they may be constructed subject to the approval of the Board.

(c) Such openings shall be protected with automatic double fire-doors which when combined will have a fire resistance rating of four hours. *See* also Clause 807.

2104. Openings in Walls of Fire-isolated Stairways.—Except as provided in Clause 2004 (f), openings in walls of fire-isolated stairways shall be protected by one-hour fire doors as defined in Clause 807 (b) or by glazing conforming to the provisions of Clause 2102. Such fire doors shall conform also to the requirements of Clause 2020.

2105. Openings Near External Fire-isolated Stairways.—(a) All windows within 10 feet of an external stairway shall be one-hour fire windows conforming to the requirements of Clause 808.

(b) All doors within 10 feet of such stairway shall conform to the requirements for doors to fire-isolated stairways prescribed in Clause 2004.

2106. Doorways of Lift Shafts.—Doorways of lift shafts of buildings shall be fitted with—

- (a) approved roller shutters; or
- (b) one-hour fire doors, any glazing therein conforming to the provisions of Clause 807 (f).

2107. Openings in External Walls.—(a) Every building except buildings of Class I, II, and III, not more than three stories in height shall have one-hour fire doors, fire shutters or one-hour fire windows complying with the requirements of Clause 807 fitted to every opening in the external walls when such opening is less than 20 feet distant in a direct line from an opening in another building.

(b) Openings in the external walls of buildings built within 3 feet of and overlooking land in other occupation and all openings in external walls abutting on enclosed light courts common to separate buildings shall either be—

- (i) fitted with one-hour fire windows; or
- (ii) protected with tin clad or wire gauze shutters, provided that the provisions of this clause shall not apply in the case of—
 - (i) show windows on a street front;
 - (ii) shop fronts in an arcade building fitted with an automatic sprinkler system approved by an officer authorized by the Board, or having window backs and shop doors with a one-hour fire rating.

(c) For the purpose of this clause when a building is divided into two or more sections by fire walls each section shall be regarded as a separate building.

2108. Openings Overlooking Flat Roof.—(a) All openings overlooking a flat roof and providing a means of access to the roof for providing light to the building shall—

- (i) in the case of door openings be fitted with doors cased externally with sheet metal of not less than 26 B.G. or with one-hour fire doors; and
- (ii) in the case of window openings conform to the requirements of Clause 2107 (b) (ii).

(b) The provisions of sub-clause (a) shall not apply to doors or windows of a caretaker's residence or other structure constructed on the roof of a building when such residence or structure is separated by party structure from all other portions of the building.

2109. Skylights in Courts.—(a) All skylights which are placed in courts or wells constructed in buildings, or which are constructed in roofs of fire resisting construction, shall be constructed with glazed metal or glazed concrete frames having a fire resistance rating of one hour and shall conform with Clause 808 (d).

(b) Every skylight not required to comply with sub-clause (a) of this clause shall be glazed with wired glass or shall be protected by a substantial wire screen placed below the skylight.

2110. Openings Connecting Dwelling with Trade Building.—When the walls or floors separating a portion of a building used for purposes of trade or manufacture from that used for dwelling purposes are required by Clause 2204 to have a fire resistance rating, then all door openings in such walls or floors shall be protected by fire doors and windows as required for party structure by Clauses 2101 and 2102.

2111. References.—For the purposes of this Building Manual, fire doors, fire windows, and fire shutters shall mean fire doors, fire windows, and fire shutters as defined in Chapter 8.

CHAPTER 22.

SUB-DIVISION OF BUILDINGS BY FIRE-RESISTING STRUCTURES.

- Clause 2201. Separation of Flats.
- Clause 2202. Subdivision of Residential and Institutional Buildings.
- Clause 2203. Separation of Occupations in Other Buildings.
- Clause 2204. Separation of Different Classes of Occupancy Within a Building.
- Clause 2205. Separation of Different Types of Construction.
- Clause 2206. Limitation of Floor Area.

CHAPTER 22.

SUB-DIVISION OF BUILDINGS BY FIRE-RESISTING STRUCTURES.

2201. **Separation of Flats.**—In every building of Class II. Occupancy every flat shall be separated—

- (a) from corridors provided for the common use of the occupants by walls having a fire-resistance rating of one hour;
- (b) from other portions of the building by—
 - (i) walls having a fire-resistance rating of three hours or, in the case of a building of Type 1 or Type 2 Construction of one hour;
 - (ii) by floors having a fire-resistance rating of two hours.

2202. **Sub-division of Residential and Institutional Buildings.**—All walls and partitions between rooms and between a room and corridor in buildings of Class III. and institutional buildings of Class IX. Occupancy shall have a fire-resistance rating of one hour in the case of buildings of Type 1 and 2 Construction and of two hours in the case of buildings of Type 3 Construction. Openings in such walls and partitions shall not be required to have a fire-resistance rating.

2203. **Separation of Occupations in Other Buildings.**—(a) In buildings of Class V. Occupancy, floors separating different occupations shall have a fire-resistance rating of one hour.

(b) In buildings of Classes VI., VII. and VIII. Occupancy, different occupations shall be separated by party structures having a fire-resistance rating of one hour.

(c) In assembly buildings of Class IX. Occupancy, different occupations shall be separated by party structures having a fire-resistance rating of four hours in the case of walls and of three hours in the case of floors.

2204. **Separation of Different Classes of Occupancy Within a Building.**—(a) In any building constructed in part as a dwelling and in part to be used for business purposes, such parts shall be separated by a party structure when the total floor area used for business purposes exceeds 1,500 square feet. Such party structure shall have a fire-resistance rating of two hours.

(b) In any building constructed in part as a building of Class II. or Class III. Occupancy, and in part to be used for business purposes, such parts shall be separated by a party structure having a fire-resistance rating of two hours.

(c) In any building constructed to contain in part an assembly building of Class IX. Occupancy, such part shall be separated from the remainder of the building by a party structure having a fire-resistance rating of four hours in the case of walls and of three hours in the case of floors.

(d) In any building containing mixed Occupancies of Class VI., VII. or VIII., the various classes of Occupancy shall be separated by a party structure conforming to the requirements of Clause 2203 (b) unless otherwise approved by the Board.

(e) Garages attached to buildings—No commercial garage, motor repair shop or petrol selling station shall be located within or attached to another building unless it is separated from every other Occupancy by party structures having a fire-resistance rating of four hours in the case of walls and three hours in the case of floors.

(f) (i) Private garages may be attached to buildings of Class I., II., or III. Occupancy of Type 1, 2 or 3 Construction provided such garages shall be separated therefrom by a wall having a fire-resistance rating of one hour and/or by a floor having a fire-resistance rating of two hours. No openings shall be constructed in such wall except in compliance with sub-clause (f) (iii) of this clause.

(ii) In the case of private dwellings of Class I. Occupancy and Type 5 (wood frame) Construction such garages may be approved provided they are lined internally on walls and ceilings with $\frac{1}{8}$ -in. asbestos. No openings shall be permitted between the garage and the dwelling and no room be constructed over such garage.

(iii) Except in the case of a building of Class III. Occupancy or wood framed dwellings of Class I. Occupancy a doorway not more than 3 feet wide shall be permitted in the wall separating the garage from the residence provided the door sill is raised at least 6 inches above the garage floor and the doorway is fitted with a self-closing metal clad door.

(iv) Private garages may be attached to buildings of other classes provided such garages are separated therefrom by walls having a fire-resistance rating of four hours and floors or ceiling of three hours fire-resistance rating. Openings in such walls shall be protected by self-closing fire doors with a fire-resistance rating of two hours.

Door sills between the Occupancies shall be raised at least 12 inches.

(g) The floor of all garages shall be of concrete or other hard incombustible material.

(h) Where fire-resistance ratings of four hours for walls and three hours for floors are required in this clause, these may be reduced to three hours and two hours respectively if a sprinkler system is installed in accordance with the requirements of the Fire Underwriters' Association.

2205. Separation of Different Types of Construction.—When different types of construction in a building are separated by a fire-resisting structure, such structure shall have a fire-resistance rating of four hours in the case of a wall and of three hours in the case of a floor, including beams, girders and trusses.

2206. **Limitation of Floor Area.**—(a) No building or portion of a building of Type 3, 4, or 5 Construction used as a shop, warehouse or factory shall extend to more than 35,000 square feet total floor area, or where a sprinkler system is installed to more than 55,000 square feet, whether on one or more floors unless divided by walls having a fire-resistance rating of four hours, or by floors having a fire-resistance rating of three hours, in such a manner that the total floor area within any division shall not exceed 35,000 and 55,000 square feet respectively, except that—

- (i) the Board may consent to a larger area subject to satisfactory provision being made and maintained for lessening as far as reasonably practicable danger from fire, but so that such consent shall expire when the building ceases to be used for the purpose in respect of which the consent was given;
 - (ii) this provision shall not apply to assembly shops and similar buildings one story in height where the manufacturing process requires an undivided area.
- (b) Staircases and lift wells connecting two or more divisions shall be fire isolated by walls having a fire-resistance rating of three hours.
- (c) Doors opening on to such staircases and lift wells shall be two-hour fire doors.
-

CHAPTER 23.

SPECIAL CLASS REQUIREMENTS.

CLASSES I, II, AND IV. OCCUPANCY: HOUSES, FLATS AND DWELLINGS ATTACHED TO OTHER CLASSES OF BUILDINGS.

- Clause 2301. Kitchens.
- Clause 2302. Bathrooms.
- Clause 2303. Laundry Accommodation.

CLASS III. OCCUPANCY: RESIDENTIAL BUILDINGS.

- Clause 2304. Bathrooms.
- Clause 2305. Wash Basins.
- Clause 2306. Walls and Floors of Bathrooms and Lavatories.

CLASS VI. OCCUPANCY: SHOPS.

- Clause 2307. Shopfronts.
- Clause 2308. Showcases and Mirrors.
- Clause 2309. Facings.
- Clause 2310. Stall-boards.
- Clause 2311. Shopfronts Abutting on Exits.
- Clause 2312. Kiosks.
- Clause 2313. Floors and Walls in Shops and Kiosks Used for Sale of Perishable Foodstuffs.
- Clause 2314. Loading Notice Plate.

CLASS VIII. OCCUPANCY: FACTORIES.

- Clause 2315. Loading Notice Plate.
- Clause 2316. Air Space.
- Clause 2317. Bathrooms, &c.
- Clause 2318. Washing Facilities.
- Clause 2319. Roofs of Rooms Occupied by Females.
- Clause 2320. Concrete Floors.
- Clause 2321. Drinking Water.

CLASS X. OCCUPANCY: OUTBUILDINGS.

- Clause 2322. Stables.
- Clause 2323. Workshops.
- Clause 2324. Laundries.
- Clause 2325. Motor Garages.
- Clause 2326. Walls of Garages.
- Clause 2327. Pan Closets.
- Clause 2328. Envelope Type Pans.
- Clause 2329. Conservatories, Greenhouses and Aviaries.
- Clause 2330. Fowlhouses, Kennels, &c.

CHAPTER 23.**SPECIAL CLASS REQUIREMENTS.****Classes I, II, and IV. Occupancy: Houses, Flats and Dwellings Attached to Other Classes of Buildings.**

2301. **Kitchens.**—(a) Every dwelling shall be provided with—

- (i) a room or annexe to be used as a kitchen, and having one wall of such room or annexe on external wall;
- (ii) suitable facilities for the storage of foodstuffs.

(b) Every kitchen shall be provided with—

- (i) a suitable appliance for the cooking of food, but no cooking appliance shall be placed in or upon any balcony, balconette, bathroom, portico, stair, landing, verandah, bedroom, sleep-out, or passageway or any place other than a kitchen, kitchenette, or kitchen-living room;
- (ii) a combined sink and draining board of impervious material fitted in position and having a water tap over it and a waste pipe leading from it to an impervious drain.

(c) Where a kitchen has a floor area of less than 70 square feet it shall be constructed as an annexe to a habitable room and the opening between the kitchen and the habitable room shall be at least 7 feet in height and 5 feet in width.

2302. **Bathrooms.**—(a) Except where otherwise approved by the Board and subject to the provisions of sub-clause (b) there shall be provided in every dwelling hereafter constructed a bathroom having an area of not less than 30 square feet in which shall be fixed a bath of adequate size and wash basin. Where a W/C. pedestal is installed in a bathroom the minimum floor area shall be increased to 35 square feet, and where a washing-rinsing machine is installed the minimum floor area shall be increased by 7 square feet; the floor and walls to be in accordance with Clause 2306. For the purpose of this clause the term "bath" shall include an approved type of shower tray provided that there is a clear depth of not less than 12 inches internally and that the tray is provided with cap and lining, plug and washer, and 2-in. trap and waste in general conformity with other sanitary fittings.

(b) In any building of Class II. Occupancy containing only one habitable room, there may be substituted for the bathroom required by sub-clause (a) a recess having an area of not less than 18 square feet and containing a shower and a wash hand basin; the floors and walls to be in accordance with Clause 2306.

2303. **Laundry Accommodation.**—(a) In every dwelling of Classes I. and IV. Occupancy there shall be provided appurtenant thereto and for the sole use of the occupants thereof a laundry equipped with approved washboiler and troughs, or other approved means of laundering.

(b) In every building constructed to contain flats (Class II. Occupancy) there shall be provided appurtenant thereto at least one laundry equipped with approved washboiler and troughs or other approved means of laundering for every four flats in such building.

(c) Where in the opinion of an officer authorized by the Board adequate and satisfactory means of laundering are provided in each flat, sub-clause (b) hereof shall not apply.

(d) An officer authorized by the Board shall have the power to waive the necessity for a laundry if an approved mechanical washing-rinsing machine is installed. The washing-rinsing machine shall be installed in the bathroom or where approved by an officer authorized by the Board, and shall have water connected to it, and a waste pipe leading from it to an impervious drain, or such other means of dispensing of waste water as is approved by an officer authorized by the Board.

Class III. Occupancy: Residential Buildings.

2304. **Bathrooms.**—(a) Every building of Class III. Occupancy constructed to contain accommodation for not more than eight persons shall be provided with a bathroom equipped with either a combined plunge and shower bath or with a plunge bath and a recess containing a shower, together with one wash basin. No bathroom shall have a floor area less than 30 square feet.

(b) In every building of Class III. Occupancy constructed to contain accommodation for more than eight persons, one bathroom conforming to the requirements of sub-clause (a) shall be provided in respect of the first eight persons and additional bathrooms equipped with a plunge or shower bath shall be provided in the proportion of one bathroom for every additional six persons or fraction thereof.

2305. **Wash Basins.**—(a) In every building of Class III. Occupancy wash basins connected with an approved drainage system shall be provided. Where wash basins are not provided in all bedrooms, the number of such wash basins shall not be less than one to every four bedrooms not equipped with wash basins including that required under Clause 2304 (a).

(b) In every licensed victualler's premises there shall be provided such wash basins for the use of the public frequenting the premises as the Board may require.

2306. **Walls and Floors of Bathrooms and Lavatories.**—The walls of every bathroom and lavatory shall be provided with a smooth impervious finish to a height of 6 feet and the floor shall be constructed of structural concrete with an approved impervious finish or such other impervious floor construction as may be approved by an officer authorized by the Board.

Class VI. Occupancy: Shops.

2307. **Shopfronts.**—(a) No shopfront shall exceed two stories in height above the level of the public footpath in front of the shop.

(b) No part of any shopfront frame shall be fixed—

(i) nearer than 3 inches to the centre line of a reinforced concrete party wall;

(ii) nearer than 4 inches to the centre of a masonry party wall; or

(iii) nearer than 4 inches to a wall of adjoining premises when such premises have a separate wall.

(c) An arch or lintel complying with the requirements of Clause 1410 shall be provided over every shopfront opening.

(d) Shopfront openings may be framed wholly or partly in structural steel or reinforced concrete in conformity with the provisions of Clause 1426 (j).

(e) The upper section of a shopfront may, providing such portion is constructed not less than 9 feet above the pavement, project not more than 18 inches.

(f) Mouldings shall not project more than $\frac{1}{2}$ inch beyond the street alignment in any portion of the shopfront at a lesser height than 9 feet above the pavement.

2308. **Showcases and Mirrors.**—Mirrors and showcases shall be affixed flat against a wall, pier, or pilaster in such a way that no portion shall project beyond the building line.

2309. **Facings.**—Tilings or other applied facing on any wall, pier, or pilaster shall not project beyond the building line at a lesser height than 9 feet above the pavement.

2310. **Stall-boards.**—Stall-boards under shopfronts shall be constructed of masonry, concrete or other material having a fire-resistance rating of not less than one hour.

2311. **Shopfronts Abutting on Exits.**—Where a shopfront abutting on an exit from a stairway required to be fire-isolated is returned along a passage or lobby to a depth greater than the width of such passage or lobby, such shopfront shall be protected by a sprinkler system, approved self-coiling corrugated steel shutters running in metal grooves and fitted with proper appliances on the outside thereof suitable for raising and lowering, or by material having a fire-resistance rating of one hour.

2312. **Kiosks.**—(a) Kiosks may be constructed in positions approved by the Board or an officer authorized by the Board.

(b) Every kiosk shall have—

(i) a minimum height of 8 feet measured from the floor to the ceiling;

(ii) a minimum internal dimension of 3 ft. 6 in.;

(iii) adequate ventilation communicating directly with the external air;

(iv) a minimum floor area of 20 square feet per person when occupied by more than one person.

(c) For the purposes of this clause, a kiosk means a stall or enclosed apartment for the sale or distribution of goods and which the public do not enter.

2313. **Floors and Walls in Shops and Kiosks used for Sale of Perishable Foodstuffs.**—In all shops hereafter constructed in which perishable foodstuffs are to be sold, or displayed for sale, floors shall be constructed of impervious material or suitably covered as to be impervious, and walls shall have a smooth impervious finish to a height of 6 feet.

2314. Loading Notice Plate.—On completion of any building of Class VI., VII., or VIII. Occupancy constructed pursuant to a permit granted under the Building Regulations, and before the occupation of any such building, the owner shall affix and subsequently maintain in conspicuous places on the walls thereof, not less than 3 feet above the floor, permanently attached plates in the following form showing the safe live load for which the floor has been designed:—

SAFE FLOOR LOAD.

Pounds per square foot.

Uniformly distributed

Class VIII. Occupancy: Factories.

2315. Loading Notice Plate.—*See* Clause 2314.

2316. Air Space.—From the floor level to a height of 13 feet, the free air space in every workroom in a building of Class VIII. Occupancy shall amount to at least 400 cubic feet per person employed therein.

2317. Bathrooms, &c.—Where in the opinion of the Board the nature of the manufacturing process to be carried on in any factory so requires, bathrooms, and/or rest rooms for the use of the employees in such factories shall be provided.

2318. Washing Facilities.—(a) Washing facilities shall be provided in every factory consisting of one wash basin and tap for every fifteen persons or fraction of fifteen starting or finishing work at one time or two feet of washing troughs for fifteen persons or fraction of fifteen starting or finishing work at any time together with water sprays spaced not more than 2 feet apart; and

(b) In any building in which females shall be required to engage in work other than clean sedentary work such other washing facilities shall be provided as in the opinion of the Board are necessary.

2319. Roofs of Rooms Occupied by Females.—Where any room in a factory is to be occupied by female employees and the roof is of iron and at a lesser distance than 15 feet above the floor either the roof shall be lined or a ceiling constructed in such room.

2320. Concrete Floors.—If floors in factories are constructed of concrete, masonry, asphalt or similar materials, wooden floors, pads, or platforms, or insets of bitumen or strips of bituminous felt shall be provided over all areas where employees are required to stand at their work.

2321. Drinking Water.—Every factory shall be provided with bubblers and mouth guards or with other approved devices for the supply of clean, wholesome drinking water, so placed as to be conveniently accessible to all employees at all times.

Class X. Occupancy: Outbuildings.

2322. Stables.—Subject to any other Ordinance, stables may be constructed with the permission of and in areas specified by the Board and subject to the following conditions:—

(a) Stables erected in residential areas shall contain not more than two stalls.

- (b) The external walls shall not exceed 10 feet in height from the level of the ground to the top plate of the wall or the under-side of the eaves.
- (c) The floor shall be paved with hard bricks, blue pitchers or wood blocks jointed in cement mortar or of sleepers grouted in tar or with cement, concrete or other approved impervious material.
- (d) The building, of whatever material constructed, shall be sited—
 - (i) not less than 80 feet from the property alignment of the street or road to which such property has a frontage;
 - (ii) not less than 30 feet from any other street or road to which such property has a frontage;
 - (iii) not less than 3 feet from the boundary of the site other than a street boundary unless the external wall adjoining such boundary shall be carried up as a parapet at least 15 inches in height above the roof, flat or gutter of such building;
 - (iv) not less than 30 feet or any greater distance required by the Health Regulations or Local By-laws from any other building used as a dwelling-house whether on the same allotment of land or any other adjoining allotment.
- (e) The provisions of all Health Regulations and Local By-laws shall be complied with.
- (f) No room other than a storeroom shall be constructed over or adjoining a stable.
- (g) A manure container or containers constructed of impervious material and fitted with approved covers shall be provided in connexion with every stable, and where such container is a pit it shall conform to the requirements set out in sub-clause (c) hereof for stables.

2323. **Workshops.**—Workshops (other than those coming within the classification of factories as defined in this Building Manual), sheds and similar structures may be constructed, subject to the following conditions:—

- (a) If constructed as appurtenant to a building of another class, they shall be attached to and constructed of similar materials to the main building in which case they shall conform to the requirements as to location presented by this Building Manual for the main building; or
- (b) If detached from the main building they shall be distant not less than—
 - (i) 15 feet from any dwelling on the same allotment;
 - (ii) 30 feet from any dwelling or land leased or occupied by a person other than the lessee, owner or occupier of the land on which such structure is to be constructed;
 - (iii) 50 feet from the boundary of the street or road to which the land upon which such structure is to be constructed has the main frontage;

- (iv) 20 feet from any other street or road to which such land has a frontage unless especially approved by the Board;
- (v) 6 feet from the boundary of any land not in the same occupation.

2324. **Laundries.**—A laundry not exceeding 150 square feet in superficial area may be constructed as appurtenant to any dwelling provided that—

- (a) if it is distant 15 feet or more from such dwelling it shall be constructed in conformity with the provisions of sub-clause (b) of Clause 2323 except that paragraph (ii) of sub-clause (b) shall not apply; and
- (b) if it is constructed within 15 feet of such dwelling it shall conform to the requirements as to distance from boundaries as prescribed by this Building Manual for such dwelling.

2325. **Motor Garages.**—(1) Motor garages constructed appurtenant to buildings of Classes I., II. and III. Occupancy shall conform to the building limits as required by this Building Manual, and to the following requirements:—

- (a) Except where the consent of the Board to the contrary has been obtained the walls of every garage exceeding 400 square feet in area shall be constructed of masonry, concrete, reinforced concrete, or other hard and incombustible material.
- (b) Every garage attached to a building shall be separated therefrom by a floor or ceiling having a fire-resistance rating of 1½ hours or by walls and/or doors having a fire-resistance rating of one hour, and any floor constructed in such garage shall be of incombustible material.
- (c) Every garage within 10 feet of the main building shall be deemed to be attached to that building for purposes of interpreting sub-clause (b) above.
- (d) Where the garage is constructed nearer than 6 feet to the boundary of any adjoining allotment, the wall nearest such boundary shall be constructed of masonry, concrete, reinforced concrete, or other hard and incombustible material approved by an officer authorized by the Board.

(2) Private motor garages may be built in accordance with the following requirements:—

- (a) No portion of a garage shall project in advance or be nearer to the alignment of the street to which the lot has the principal frontage than is set down in sub-paragraphs (a) (i), (a) (ii), (a) (iii) of this clause, except where the physical configuration of the site thereof renders it impossible or impracticable to comply with this requirement of those sub-paragraphs. In such cases the Board may grant permission for the erection of a garage at a lesser distance from the street alignment.

- (i) In the case of a garage built as an integral part of the dwelling to which it is appurtenant, the front of the dwelling or the building line prescribed in Clause 311, whichever is the lesser.
 - (ii) In the case of a detached brick garage, the front of the dwelling or the building line prescribed in Clause 311, whichever is the lesser.
 - (iii) In the case of a garage of Type 4 or 5 Construction, the rear of the dwelling, except in optional areas where the Board may approve the erection of such garage provided no portion thereof projects in advance of the dwelling to which it is appurtenant or the building line prescribed in Clause 311, whichever is the lesser.
- (b) No portion of a detached garage shall be distant less than 20 feet from any other street or road alignment to which the site has a frontage except by approval of the Board.
 - (c) The external walls of any garage not exceeding 4 squares in area shall be not more than 10 feet in height above the floor level.
 - (d) The external walls of private garages of a greater superficial area than 4 squares or exceeding 15 feet in height to the highest point of the roof, other than private garages appurtenant to wood-framed buildings of Type 5 Construction erected in areas where such dwellings may be approved by the Board shall be built of brick or concrete and shall comply with all other conditions applying to buildings of these materials. Provided, however, that if such private garage is built at less distance than 6 feet from any dwelling-house or other building or is attached to, or forms part of any such building, then such garage shall comply with all the conditions as to distance from boundaries and from other buildings as apply to the main building itself.
 - (e) The floors of all motor garages shall be constructed of approved incombustible material.
 - (f) Every private garage attached to or forming part of any dwelling-house, shop or other building shall comply with the requirements of Clause 2325 Part (1).
 - (g) No garage shall be built so that the doors open over or upon or obstruct any street, footpath or right-of-way.

2326. **Walls of Garages.**—Masonry walls of garages may be of a thickness of $4\frac{1}{2}$ inches, provided that they are constructed in mortar, of a strength not less than that of compo mortar composed of one part cement, one part lime and six parts sand, with piers projecting $4\frac{1}{2}$ inches, for a width of $13\frac{1}{2}$ inches and spaced at not more than 10-ft. centres.

CHAPTER 24.

RESTORATION OF BUILDINGS AND ALTERATIONS TO EXISTING BUILDINGS.

Clause 2401. Restoration of Buildings.

Clause 2402. Re-erection of Buildings.

Clause 2403. Alterations and Additions to Buildings.

CHAPTER 24.

RESTORATION OF BUILDINGS AND ALTERATIONS TO EXISTING BUILDINGS.

2401. **Restoration of Buildings.**—If in the opinion of an officer authorized by the Board any building be destroyed, demolished, or pulled down to the extent of more than half of its value, exclusive of foundations, such building shall not be restored, reconstructed, or repaired except in accordance with this Building Manual.

2402. **Re-erection of Buildings.**—In the event of the destruction by fire or other unforeseen cause of any building which exceeds the maximum height permitted under Chapter 3 of this Building Manual such building shall not be reconstructed except in conformity with the provisions of this Building Manual.

2403. **Alterations and Additions to Buildings.**—(a) General.—All alterations, additions, and repairs to buildings shall conform to the provisions of this Building Manual.

(b) Major Alterations and Repairs.—(i) If alterations and/or repairs in excess of 50 per cent. of the value of an existing building are made to such building the entire building shall be made to conform to the requirements of this Building Manual.

(ii) Any building which for any reason whatsoever requires repairs at any one time, in excess of 50 per cent. of the value thereof, not deducting from such value any loss caused by fire or any other reason, shall be made to conform to the requirements of this Building Manual or shall be demolished.

(c) Changed Occupancy.—(i) If the existing use of occupancy of a building is changed and the building does not conform to the requirements of this Building Manual for the proposed new occupancy, the entire building shall be brought into conformity with this Building Manual, except that if the use or occupancy of only portion of the building is changed and such portion is separated from the remainder of the building in accordance with the provisions of Chapter 23, then such portion only need be made to comply with this Building Manual.

(ii) Any existing building not covered by the preceding paragraph which has its floor area or its number of stories increased or its use or occupancy changed shall be provided with exits and fire protection facilities as required by this Building Manual for the proposed new occupancy or occupancies.

(d) Minor Alterations and Repairs. Minor alterations and repairs not covered by the preceding paragraphs may be made with the same type of materials as used in the original construction provided that not more than 25 per cent. of the roof covering of any building shall be replaced in any period of twelve months unless the entire roof covering is made to conform to the requirements of this Building Manual. New roofing meeting the requirements of this Building Manual may be placed over existing roofing where such existing roofing and the roof framing are such as to permit the new roofing to be properly and securely fastened.

References.—Increasing thickness of Existing Walls. *See* Clauses 1455-1456.

CHAPTER 25.
**RUINOUS AND DANGEROUS BUILDINGS AND BUILDINGS UNFIT
OR UNSUITABLE FOR HUMAN HABITATION.**

- Clause 2501. Power of Entry.
Clause 2502. Procedure in Case of Ruinous and Dangerous Buildings.
Clause 2503. Procedure in case of Buildings unfit or unsuitable for Human Habitation.
Clause 2504. Notice to Owner.
Clause 2505. Powers of the Board.

CHAPTER 25.
**RUINOUS AND DANGEROUS BUILDINGS AND BUILDINGS UNFIT
OR UNSUITABLE FOR HUMAN HABITATION.**

2501. **Power of Entry.**—If an officer authorized by the Board has cause to believe that any building or any part of a building is in a ruinous state or is dangerous to the public or is unfit or unsuitable for human habitation, occupation or use, he may enter therein or thereon and make such inspection and tests as may be necessary to determine whether such building or part thereof is in a ruinous state or dangerous to the public or unfit or unsuitable for human habitation, occupation or use.

2502. **Procedure in Case of Ruinous and Dangerous Buildings.**—If after inspection it appears to an officer authorized by the Board that any building or portion thereof or any fixture attached thereto or any fence on or within 10 feet of the street alignment is in a ruinous state or is dangerous to the public or to the occupiers of the building, he—

- (a) may cause a proper boarding or fence or props to be erected for the protection of the public and of the occupiers;
- (b) shall, where necessary, cause the adjoining buildings to be properly shored up;
- (c) shall submit to the Board a report describing the condition of the building, fixture or fence and any action taken by him for the protection of the public and/or occupiers of the building and for the shoring up of adjoining buildings.

2503. **Procedure in case of Buildings unfit or unsuitable for Human Habitation.**—Where the Chief Medical Officer advises the Board that in his opinion a building is unfit or unsuitable for human habitation, occupation or use, the Board shall cause an inspection to be made of the building. If after inspection it appears to an officer authorized by the Board that the building or portion thereof is unfit or unsuitable for human habitation, occupation or use, the officer shall submit to the Board a report describing the condition of the building.

2504. **Notice to Owner.**—On receipt of a report from an officer authorized by the Board, the Board shall, if in its opinion circumstances so warrant, serve notice to the owner of such building, fixture or fence requiring him within a time to be specified in such notice to pull down, secure, or repair such building or portion thereof, fixture or fence.

2505. **Powers of the Board.**—If within the time specified the said owner does not pull down, secure, or repair such building, fixture or fence to the satisfaction of the Board, he shall be deemed guilty of a breach of the Regulations and the Board may exercise in relation to such building, fixture or fence the powers conferred by the Regulations as if the same were a building, fixture or fence constructed contrary to the Regulations.

CHAPTER 26.

FENCES.

- Clause 2601. Height Limit of Fences.
- Clause 2602. Hoods, Pergolas, &c.
- Clause 2603. Seepage to be Diverted.
- Clause 2604. Barbed Wire Adjacent to Streets.

CHAPTER 26.

FENCES.

2601. **Height Limit of Fences.**—Such fences of every allotment situated at any intersection of streets used for vehicular traffic as are within a distance of 30 feet from the point of the intersection of the building alignments of such streets shall not be constructed to a greater height than 4 feet above the level of the footpath except with the consent of the Board.

2602. **Hoods, Pergolas, &c.**—(a) Hoods, pergolas and ornamental heads to gateways or fences shall be constructed in accordance with a design and of materials approved by an officer authorized by the Board.

(b) No part of any such hood, pergola or ornamental head shall project more than 12 inches beyond the street alignment and no projection shall be at a lesser height than 9 feet from the level of the footpath.

2603. **Seepage to be Diverted.**—All retaining walls or brick or concrete fences shall have a seepage diverted in a manner approved by an officer authorized by the Board.

2604. **Barbed Wire Adjacent to Streets.**—Where barbed wire is erected adjacent to any street it shall be set back not less than 12 inches from the street alignment up to a height of 7 ft. 6 in. above the level of the street, but in no case shall barbed wire project beyond the street alignment.

In residential areas no barbed wire shall be used for or on fences at a height of less than 7 feet vertically above the level of any footpath, street or right-of-way.

CHAPTER 27.

STREET VERANDAHS AND SUN BLINDS.

PART I.—STREET VERANDAHS.

- Clause 2701. Construction.
- Clause 2702. Roof of Cantilever Verandah.
- Clause 2703. Verandah Ceilings.
- Clause 2704. Height above Pavement and Projection.
- Clause 2705. Blinds under Verandahs.

PART II.—SUN BLINDS.

- Clause 2706. Height.
- Clause 2707. Construction.

CHAPTER 27.

STREET VERANDAHS AND SUN BLINDS.

Part I.—Street Verandahs.

2701. **Construction.**—(a) Every cantilever or suspended girder shall be constructed of steel or reinforced concrete; purlins and rafters shall be of timber or other approved material.

(b) Construction of pillar verandahs shall not be permitted.

2702. **Roof of Cantilever Verandah.**—The roof of every cantilever or suspended verandah shall—

- (a) have a fall of $\frac{1}{2}$ inch per foot;
- (b) be covered with approved fire-retardant material which is impervious to moisture and conforms to the provisions of Clause 914;
- (c) be provided with a gutter of approved material; and
- (d) be provided with a downpipe or pipes of wrought iron, cast iron or other approved material chased into the walls or piers or so set back as not to project beyond the face of the building to a height of not less than 8 feet above pavement level and such downpipes shall discharge into the street channel or underground stormwater drain.

2703. **Verandah Ceilings.**—Where so required by the Board, the underside of all verandahs shall be lined.

2704. **Height Above Pavement and Projection.**—The height of every cantilever verandah shall not be less than 10 feet above the kerb level. Projection of face of awning from building line shall be determined by an officer authorized by the Board.

2705. **Blinds Under Verandahs.**—Blinds may be provided under verandahs subject to the approval of the Public Authority and in no instance shall the blind or its supports be at a less height than 7 ft. 6 in. above the footway. Reference—Loading on Roofs—See Chapter 9.

Part II.—Sun Blinds.

2706. **Height.**—Every sun blind shall be so constructed that it is in no part at a lesser height than 7 ft. 6 in. above the footway and that it does not project more than 6 feet from the building to which it is attached.

2707. **Construction.**—Every sun blind shall be—

- (a) constructed of linen or cotton duck weighing not less than 10 oz. to the square yard or of other approved material;
- (b) well sewn or properly secured;
- (c) attached in an approved manner and securely fixed to the building or incorporated in the shop front design.

CHAPTER 28.

STORAGE OF INFLAMMABLE LIQUIDS, DANGEROUS GOODS, ETC.

- Clause 2801. Inflammable Liquids.
- Clause 2802. Storage of Inflammable Liquids in Buildings.
- Clause 2803. Storage of Inflammable Liquids in Underground Tanks. (Under 1,000 gallons).
- Clause 2804. Storage of Inflammable Liquids in Underground Tanks. (Over 1,000 gallons capacity).
- Clause 2805. Storage of Inflammable Liquids in Surface Tanks.
- Clause 2806. Storage of Inflammable Oils.
- Clause 2807. Fuel Oils.
- Clause 2808. Petrol Pumps.
- Clause 2809. Storage of Dangerous Materials in Buildings.
- Clause 2810. Storage and Processing of Dangerous Materials.

CHAPTER 28.

STORAGE OF INFLAMMABLE LIQUIDS, DANGEROUS GOODS, ETC.

2801. **Inflammable Liquids.**—Inflammable liquids are sub-divided into Classes A and B as hereunder:—

Class A: Shall include those liquids which will flash or emit an inflammable vapour at or below a temperature of 73 degrees Fahrenheit, Abel Close Test.

Class B: Shall include those liquids which will neither flash nor emit an inflammable vapour at a temperature less than 73 degrees Fahrenheit, Abel Close Test.

2802. **Storage of Inflammable Liquids in Buildings.**—Inflammable liquids in quantities exceeding either 50 gallons of Class A or 250 gallons of Class B shall not be stored in any room or building except in accordance with the following conditions:—

- (a) Such room or building shall be adequately ventilated;
- (b) Such room or building shall be constructed with walls having a fire-resistance rating of three hours;
- (c) External doors of such rooms if within 20 feet of any door or window or other opening not in the same wall as, and parallel to, such first mentioned external doors, also all internal doors of such rooms, shall be two-hour fire doors complying with the requirements of Clause 807;

- (d) Where such Class A inflammable liquid is to be stored in quantities of less than 250 gallons, the door shall, if possible, open directly into the outer air, but where this is impracticable the floor shall be sunk below the level of the adjoining floors to the approval of an officer authorized by the Board, but in no case less than 12 inches. Alternatively a concrete surrounding kerb of a capacity approved by an officer authorized by the Board shall be provided;
- (e) Where the quantity of inflammable liquid of either class to be stored exceeds 250 gallons, in bulk or in containers of capacity exceeding 50 gallons, the total storage capacity of the room or building below the level of the lowest opening in the wall of such building shall exceed by at least one-eighth the total quantity for which storage permission is granted. Where, however, the whole of a ground floor is to be used for storage, this storage capacity (including the one-eighth in excess) may be provided by means of an external well formed by a wall of brick, stone or concrete completely surrounding such storage floor. Openings will not be permitted for any purpose in this enclosing wall and in no case shall the top of this well be less than 1 foot above the level to which the stored liquid would rise if permitted to run free;
- (f) where the quantity of inflammable liquid of either class to be stored exceeds 250 gallons all in containers of capacity less than 50 gallons, the total storage capacity of the room or building below the level of the lowest opening shall be as follows:—
- (i) Where the total storage does not exceed 800 gallons, not less than 50 per cent. in excess of such storage.
 - (ii) Where the total storage exceeds 800 gallons, not less than 30 per cent. in excess of such storage.
- Provided that this storage capacity may be obtained by the use of an external well similarly as in the last preceding sub-clause (e);
- (g) In such areas and sites as are specially approved by the Board, buildings of Type 4 unprotected metal construction may be permitted subject to the provision of a protective screen wall or dam complying with the requirements of Clause 2805.

2803. Storage of Inflammable Liquids in Underground Tanks—Of Under 1,000 Gallons Capacity.—Inflammable liquids in quantities not exceeding 1,000 gallons may be stored in an underground tank or tanks provided that such is in accordance with the following provisions:—

- (a) The site for each tank shall be first approved by the local authority for that purpose;
- (b) Such tanks shall be constructed of steel plate of not less than 14-gauge thickness unless otherwise approved in cases of very small tanks, and shall be placed not less than 2 feet below the lowest floor of any building under which such tank may be situated. Sand or other approved filling materials shall be filled in over the tank to the level of the ground or floor as the

case may require. Such tanks shall be adequately and individually ventilated and every opening at or near ground level shall be fitted with a gas tight cover and cap. Except in special circumstances and then only with the approval of an officer authorized by the Board, filling pipes may only be placed in an approved position within the boundaries of the site and only so as not to cause any obstruction to the traffic whilst the tanks are being filled;

- (c) Batteries of two or more such tanks, the aggregate capacity of which exceeds 1,000 gallons, shall be placed so that there will always be a thickness of not less than 1 foot of filling material between such tanks.

2804. Storage of Inflammable Liquids in Underground Tanks Exceeding 1,000 Gallons Capacity.—Inflammable liquids in quantities exceeding 1,000 gallons may in special circumstances be stored in an underground tank provided that such is in accordance with the following provisions:—

- (i) The site for each tank shall be first approved by any local authority empowered for the purpose.
 (ii) The construction of the tank shall be subject to the approval of an officer authorized by the Board.

2805. Storage of Inflammable Liquids in Surface Tanks.—(a) Inflammable liquids in quantities exceeding either 50 gallons of Class A or 250 gallons of Class B shall not be stored in a surface tank except in accordance with the following provisions:—

- (i) The site for the tank shall be first approved by the Board for that purpose.
 (ii) Any tank upon or above the surface of the ground or partly below and partly above the surface of the ground shall be enclosed by a compound wall of brick, stone or concrete or an earthen dam of approved construction.

The height of such wall or dam shall be such that the capacity able to be retained is not less than one-eighth in excess of the total capacity for which permission is granted as tank storage, but in no case shall the top of such dam, where an earthen dam is used, be less than 2 feet above the level to which the liquid would rise if permitted to run free from the tanks, unless the profile of such earthen dam be protected by stone pitching, concrete facing or permanent protections approved by an officer authorized by the Board.

- (iii) Any opening made in the compound wall to permit access to the tank shall contain a liquid-tight door either sliding or opening inwards, made of incombustible material and of sufficient strength to resist any pressure which may be brought to bear on such door by the bursting of the tank enclosed by such wall.

(b) Storage of Inflammable Liquids not in Buildings, &c.—Where Inflammable liquids in quantities exceeding 50 gallons in the case of Class A liquids or exceeding 250 gallons in the case of Class B liquids are to be stored in places other than in buildings or underground tanks of less than 1,000

gallons capacity as hereinbefore prescribed, such liquids shall not be stored or kept within the distances prescribed in Table 2805 (b) from any building or land on which a building is or may be erected.

Condition 1 shall mean where the storage is not in tanks or where all the inflammable liquid is not contained in metallic drums or tins each containing not more than 50 gallons.

TABLE 2805 (b).

Minimum distance to a Building or land on which a Building may be erected.	Number of Gallons permitted to be stored.	
	Condition 1.	Condition 2
Within 10 feet	400	4,000
Over 10 feet and not over 15 feet	1,000	10,000
Over 15 feet and not over 20 feet	2,000	20,000
Over 20 feet and not over 30 feet	4,000	40,000
Over 30 feet and not over 40 feet	6,000	80,000
Over 40 feet and not over 50 feet	8,000	100,000
Over 50 feet and not over 60 feet	10,000	Unlimited
Over 60 feet and not over 75 feet	15,000	Unlimited
Over 75 feet and not over 100 feet	20,000	Unlimited
Over 100 feet and not over 150 feet	50,000	Unlimited
Over 150 feet	Unlimited	Unlimited

2806. **Storage of Inflammable Oils.**—In the case of storage of lubricating or other oils that will flash or emit an inflammable vapour at not below a temperature of 350 degrees Fahrenheit, not more than 10,000 gallons of such oil shall be stored on any site or in any building unless—

- (a) the site of such storage or building shall first be approved by the Board for that purpose, and when such site is an open yard or shed, it shall be enclosed with such wall or bank or be excavated to such a depth as an officer authorized by the Board may require;
- (b) any building used for such storage shall be properly ventilated and be constructed with walls having a fire-resistance rating of four hours and floors and ceilings having a fire-resistance rating of three hours;
- (c) the total cubic capacity below the level of the lowest opening in any wall of such building shall exceed by at least 25 per cent. the total quantity for which permission is granted.

2807. **Fuel Oils.**—The installation of fuel oil systems, and the storage of fuel oils shall be carried out in conformity with the provisions of S.A.A. Code No. C.B.5—1950 for Fuel Oil Installations.

2808. **Petrol Pumps.**—Petrol pumps shall only be permitted to be erected in approved positions within the boundaries of the site, and then only so as not to cause any obstruction to the traffic whilst being used.

2809. Storage of Dangerous Materials in Buildings.—Calcium carbide in quantities exceeding 5 cwt. or similar quantities of other highly inflammable or dangerous materials (excluding inflammable liquids and oils) shall not be stored in any room or building except in accordance with the following provisions:—

- (a) The site shall be first approved by the Board for the purpose;
- (b) Such room or building shall be of a construction fire protected with walls having a fire-resistance rating of four hours and floors and ceilings having a fire-resistance rating of three hours, but in such areas and sites as are specially approved by the Local Authority buildings of unprotected metal construction may be permitted;
- (c) In the case of buildings already erected, the design construction and fire-proofing or the alteration of such buildings shall first be approved by an officer authorized by the Board and no such buildings shall be used for such storage purposes until the approval of an officer authorized by the Board has been received.

2810. Storage and Processing of Dangerous Materials.—The storage of inflammable material and the processing of dangerous or inflammable materials shall only be permitted if details and plans have been submitted to and approved by an officer authorized by the Board.

CHAPTER 29.

SANITATION.

- Clause 2811. Requirements.
- Clause 2812. Septic Tank Installations.
- Clause 2813. Disposal of Sullage and Waste Water.
- Clause 2814. Materials.
- Clause 2815. Inspection.

CHAPTER 29.

SANITATION.

2811. **Requirements.**—Provision shall be made in all classes of buildings, where required by the Board, for water closets or an approved device for the treatment of nightsoil in accordance with the scale as laid down in Division 19 of Part V. of the Sewerage Regulations made under the *Supply of Services Ordinance 1952-1958*.

2812. **Septic Tank Installations.**—Where septic tank installation is required by the Board, such installation shall be in accordance with plans and specifications approved by the Board.

2813. **Disposal of Sullage and Waste Water.**—Where sullage and waste water cannot be disposed through a sewerage or septic tank system, disposal shall be through a grease-trap and subsoil drainage in accordance with plans and specifications approved by the Board.

2814. **Materials.**—All drains shall be constructed of cast-iron, brick, stone, concrete, salt-glazed ware, or other material approved by an officer authorized by the Board.

2815. **Inspection.**—All drainage installations shall be subject to inspection as required by an officer authorized by the Board.

0023526416



NORTHERN TERRITORY LIBRARY

WTC
692.30994295
NORT