

BUILDING CODE

CITY and COUNTY
of HONOLULU

1929

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ORDINANCE No. 490

Ord. # 26

Adopted in June, 1911.
first Building Code
for Honolulu

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Ordinance No. 490

An Ordinance To Be Known as the BUILDING CODE:

Repealing Chapter II of the Revised Ordinances of the City and County of Honolulu, 1923, and all Amendments thereto, and enacting Chapters 1 to 19, inclusive, all pertaining to Building.

Be It Ordained by the People of the City and County of Honolulu:

CHAPTER 1

ADMINISTRATION

Section 1.110. Application for Permit. Before proceeding with the construction, enlargement, alteration, repair or removal of any building or other structure, a permit therefor shall be first obtained by the owner, or the lessee or agent of either, from the Department of Buildings. The application for such permit shall be made on a form which shall be furnished by the Department of Buildings on which applicant shall state the site, the character, the proposed use, the names of the owner, architect and builder, the estimated time to complete, the dimensions, the estimated cost and the use proposed of the structure contemplated, together with whatever additional data may be deemed necessary by the Superintendent of Buildings.

Provided, however, where such work is outside the fire limit, that the provisions of this section shall not apply to (a) the restoration of plaster, papering, or painting and (b) to repair work not exceeding One Hundred Dollars (\$100.00) in cost and which does not involve the

exterior or party walls, trusses, bearing columns, stairs, fire escapes or any structural members.

Note: The approval of the Territorial Board of Health is required by law on all building permit applications.

Section 1.111. Fees for Permits, for inspection by the Superintendent of Buildings shall be as follows:

Work to cost not more than \$100.00—the sum of \$1.00.

Work to cost more than \$100.00 and not more than \$500.00—the sum of \$3.00.

Work to cost more than \$500.00 and not more than \$1500.00—the sum of \$4.00.

Work to cost more than \$1500.00 and not more than \$2500.00—the sum of \$5.00.

Work to cost more than \$2500.00 and not more than \$3500.00—the sum of \$6.00.

Work to cost more than \$3500.00 and not more than \$5000.00—the sum of \$7.50.

Work to cost more than \$5000.00 and not more than \$100,000.00—\$7.50 for the first \$5000.00 and 10 cents for each \$100.00 or fraction thereof in excess of the sum of \$5000.00.

Work to cost more than \$100,000.00—\$110.00 for the first \$100,000.00 and 5 cents for each \$100.00 or fraction thereof in excess of \$100,000.00.

Section 1.112. More Than One Structure. Where separate structures are contemplated on the same site, one permit may be issued and the charge made as though one structure were contemplated, provided such application covers one contract or project as a working unit.

Section 1.113. Filing of Plans. Plans and specifications for all work to cost more than One Thousand Dollars (\$1000.00) shall be filed with the Superintendent of Buildings. Plans in duplicate shall be permanent process copies or

ink lined drawings on permanent paper and shall show sufficient detail to clearly define the structural elements and general character of the work proposed.

In the case of a new building a plot plan showing the location of the building with relation to other buildings on the same property, if any, must be filed.

One set of plans with the mark of approval of the Superintendent of Buildings shall at all times be kept on the work.

Specifications shall be typewritten. Pencil copies of plans or specifications shall not be accepted. For work costing less than Fifteen Hundred Dollars (\$1500.00) a statement on an approved form setting forth the particulars of the work may be filed in lieu of plans and specifications.

(Note: See Revised Laws of Hawaii requiring a licensed architect or engineer on certain works.)

Section 1.115. Amendments to Filed Plans. Any change involving elements prescribed by this Code in the details of the plans and specifications after the issuance of the building permit therefor, shall be made as a separate plan and filed in duplicate but otherwise in the same manner as the original application. If no increase in cost is involved, no additional charge shall be made for the permit. Such amending permit shall be obtained before any change is made in the original planned work.

Section 1.116. Permits for Temporary Frame Structures Within the Fire Limits. Temporary sheds and buildings may also be erected when used in connection with the erection, alteration or repair of permanent buildings, if such is approved by the Superintendent of Buildings.

Section 1.117. Approval of Permits by Fire Chief. No permit shall be issued for the erection, alteration or removal of any building for public assembly within the fire districts, unless approval therefor be first obtained from the Chief Engineer of the Fire Department.

Section 1.118. Permit Invalid. The Superintendent of Buildings shall not issue any building permit for any building or structure to be erected in violation of the building code, and any such permit issued contrary to the building code shall be void.

Section 1.119. Responsibility for Damage. The approval of any plans and specifications shall not relieve the architect, engineer, contractor or owner from any liability as regards damages or loss of life from the failure of any structure or part thereof, or from any liability that may accrue by reason of the use or occupancy by either of such persons of the sidewalks, street, or sub-sidewalk space, or any liability that may accrue by reason of the non-compliance by either of such persons with any of the provisions of the Building Code.

Section 1.120. Issue of Permits. The Superintendent of Buildings shall without delay examine the plans and applications for a building permit, and shall determine whether such plans conform to the requirements of Law applicable thereto and the Building Code, and if the requirements be met, shall, upon payment of the stated fee, issue a permit to perform the work contemplated.

Section 1.121. Permit Posted on Site. The applicant shall cause the permit, or an approved copy thereof, to be conspicuously posted on the site of the work.

Section 1.122. Expiration of Permit. If work authorized by any permit has not commenced

within 90 days of the issue thereof, or if the work has been abandoned for the same period, or if the work violates any of the provisions of the building Code, such permit shall become null and void, and in the event of abandonment of work or failure to commence, a new permit with the fee therefor shall be required.

Section 1.130. Certificate of Occupancy. Upon the completion of the construction or the alterations or the repairs of every building excepting dwellings, for which a permit has been issued, or whenever it is proposed to change the class of occupancy as defined elsewhere in the Building Code of a building, a certificate of occupancy shall be issued by the Superintendent of Buildings, upon an approved form, setting forth the use proposed and the maximum live load and number of persons that may be accommodated on each floor. Such use shall conform to the requirements of the uses permitted in the various districts as stipulated in the Building Code. Provided that in the case of alterations or repairs where the use is in no way changed, a new certificate need not be issued. Temporary occupancy certificates may be issued by the Superintendent of Buildings where such change is necessitated by alterations or repairs, or similar temporary uses which do not defeat the spirit of the use restrictions elsewhere in the Building Code.

It shall be unlawful for the owner and or occupant of any building or structure hereafter erected, altered or repaired to exceed the maximum allowances in his certificate of occupancy or to change the use or nature of the occupancy without first obtaining a certificate of occupancy as hereinbefore stipulated, and each and every day of such failure to comply or to obtain a certificate shall constitute a separate viola-

tion; provided, however, nothing in this section shall apply to the class of occupancy of buildings lawfully existing and used prior to the enactment of the requirements of this section. See Section 8.225.

Section 1.140. Change in Occupancy and Other Requirements. It shall be unlawful for any owner or occupant to fail to report a change in occupancy as provided in the foregoing requirements, or for any owner or occupant to fail to obtain a certificate of occupancy prior to such occupancy or to give a misleading or false description of such occupancy, and the Superintendent of Buildings is hereby authorized and empowered to cause to be vacated any occupancy contrary to the requirements of the Building Code.

Section 1.150. Alteration of Existing Buildings. No building shall be enlarged or built upon unless at the completion of such work the whole building and every part thereof shall conform to the Building Code, provided, however, that when any portion of a building is cut or altered by necessity for public use, through condemnation proceedings or otherwise, as in the case of increasing the public ways, then it shall be lawful to repair the remaining portion with the same class of materials as originally used therein, and further provided that such repairs or changes do not violate the amount of such repairs stipulated in the Building Code.

Section 1.160. Cooperation with Health Department of the Territory, and the Various City and County Officials. It shall be the duty of the Superintendent of Buildings to cooperate with the Territorial Fire Marshal and the Board of Health in all legal and proper matters in which there is a joint interest of Law and Building Code enforcement, and he shall also cooperate

with the City Planning Commission and all City and County officials in all matters where there is a common departmental or official interest. He shall also give free access to the tax assessor's office of all records in the Building Department.

Section 1.170. Invalidity of any Section. Should any section of the Building Code be held invalid, such finding shall not invalidate any other section.

Section 1.180. Date Code Is Effective. This Ordinance, which is hereby termed the "Building Code" of the City and County of Honolulu, shall become effective from and after the date of approval.

1.2 ENFORCEMENT

Section 1.210. Superintendent of Buildings. The Mayor, with the approval of the Board, shall appoint a registered Architect or Engineer as Superintendent of Buildings, whose salary shall be fixed by the Board. The Superintendent of Buildings may be removed in the same manner as he is appointed. The Superintendent of Buildings shall have all of the powers, and shall perform all of the duties necessary (1) to see that all of the requirements of the Building Code are carried out, (2) to supervise the maintenance, structural condition and repair of all public buildings and grounds under the control of the City and County Government, exclusive of public parks and the grounds of the fire stations, (3) to keep an accurate record in such form as shall be approved by the Auditor of the City and County of Honolulu of all fees received and moneys allotted, expended and obligated, (4) to deposit all fees received with the treasurer at least once each week, (5) to render an account of all permits issued and moneys received once

each month to the Board, (6) to carry out any other assignment which may be delegated to him by legislation of the Board, (7) to maintain for public inspection a record of permits issued, a map or maps showing the districts within the city proper which have restrictions of use, and generally to keep available to the public all necessary information on building restrictions and the results of structural tests of methods and materials, departmental rulings and requirements pertaining to matters hereinbefore delegated to him, and (8) to employ and remove an electric inspector, plumbing inspector and such assistants upon whom may be conferred by him the same powers as held by himself, and to employ and remove clerks, and other employees as may be necessary to execute the duties of his office when authorized so to employ, and at compensations fixed by the Board.

Section 1.220. Superintendent's Right to Enter Buildings. The Superintendent of Buildings, so far as may be necessary for the performance of his duties, shall have the right of way to enter upon, at any reasonable time, any new or unoccupied building or structure under construction, repair, alteration or removal, or any building or structure alleged to be unsafe.

Section 1.230. Test of Materials. The Superintendent of Buildings shall have the power to require the testing of any material, appliance or method of construction by disinterested parties competent to execute such work. Such tests shall be, whenever possible, by methods adopted as standard by the American Society for Testing Materials. No new class of structural material shall be used until shown by test to be adequate to fulfill the requirements of construction safety as indicated by the Building Code. Previous tests

by competent parties may be accepted in lieu of new tests by the Superintendent of Buildings.

Section 1.240. Condemnation and Repairs. Whenever any structure is found to be wholly or partially in a damaged condition, the Superintendent of Buildings shall notify and order the owner thereof to make the same safe and in conformity with the requirements of the Building Code, or to demolish the same within such period of time as may be reasonable under the circumstances.

It shall be unlawful for any owner to maintain upon his premises any dangerous structure which has been so declared by the Superintendent of Buildings.

Whenever in the judgment of the Superintendent of Buildings imminent danger exists, as an emergency measure he is hereby empowered to order such structure and/or adjoining premises vacated until such danger is abated, and it shall be unlawful for any person to disregard such order.

Section 1.250. Penalty. Any person, firm or corporation violating, or failing to comply with any of the provisions of the Building Code, as hereinbefore defined, shall be punished by a fine not exceeding \$1000.00 or by imprisonment not exceeding six (6) months, or by both such fine and imprisonment.

The continuance of any such violation after conviction shall be deemed a new offense for each day of such continuance.

Section 1.260. Appeal from Decision of Superintendent of Buildings and the Chief Engineer of the Fire Department. An applicant who has been refused a permit or the holder of a permit which has been revoked, or any one believing any order by the Superintendent of Buildings or the Chief Engineer of the Fire Department to

be improper or unreasonable, may appeal from such decision as follows:

An application for a hearing before the Board of Appeals, as hereinafter described, shall be filed in writing with the Superintendent of Buildings together with a deposit of \$75.00, which sum shall not be deposited with the Treasurer, other provisions herein to the contrary notwithstanding, but receipted for and disbursed as hereafter set forth. Within five (5) days the Superintendent of Buildings shall appoint a disinterested licensed structural engineer or architect, the applicant shall do likewise, and the two thus selected shall appoint a third licensed structural engineer or architect. In the event of inability to agree upon a third, the President of the local chapter of the American Institute of Architects shall appoint such member. These three shall constitute a Board of Appeals, which shall convene within five (5) days of appointment in the office of the Superintendent of Buildings, and hear the case as presented by the applicant and as presented by the Superintendent of Buildings and/or the Chief Engineer of the Fire Department. The City and County Attorney shall render all legal services for such boards and his advice on questions of law shall be final. The finding of the Board shall be in writing, a copy filed with the Superintendent of Buildings and one to the applicant. Clerical and other assistants shall be furnished by the Superintendent of Buildings without additional cost. Such finding shall decide the question at issue and shall be final, subject only to such action as allowed by law. Each member shall be paid the sum of \$25.00 from the \$75.00 deposited with the Superintendent of Buildings upon filing their findings.

CHAPTER 2

DEFINITIONS

Section 2.100. **Definitions.** The following terms when used in this code shall be construed to have the meaning here given them. Words used in the present include the future; the singular number includes the plural, the plural the singular; the word "person" includes a co-partnership and a corporation; "writing" includes printing and printed, photographic or typewritten matter.

Section 2.101. **Addition** means any enlargement.

Section 2.1011. **Alley** is any public space, public park or thoroughfare less than twenty (20) feet but not less than ten (10) feet in width which has been deeded to the public for public use, or publicly acquired by right of prescription.

Section 2.1012. **Alterations** mean any change.

Section 2.102. **Apartment House**, same as tenement.

Section 2.103. **Approved** refers to any device, material or construction which has been approved by the Superintendent of Buildings as a result of tests or investigations made under his direction, or upon the satisfactory evidence of competent or impartial investigation conducted by others.

Section 2.104. **Area of Buildings.** The areas of the horizontal cross-section at the ground level, measured to the center of party or fire walls and to the outside of other walls.

Section 2.105. **Ashlar Masonry.** Masonry of sawed, dressed, tooled or quarry faced stone, bonded.

Section 2.106. Ashlar Facings. Ashlar masonry used in facing masonry walls.

Section 2.107. Ashlar Random Facing. Ashlar masonry of various sized members.

Section 2.108. Basement. A story partly or completely below the level of the curb. See "Story".

Section 2.109. Bearing Wall. A wall which supports any load other than its own weight.

Section 2.110. Board shall mean the Board of Supervisors of the City and County of Honolulu.

Section 2.111. Boarding or Lodging House. A building used for boarding or lodging purposes containing not less than five (5) nor more than twenty (20) sleeping rooms for guests.

Section 2.112. Cellar. That part of a building more than 40% of which is below the grade of the street, and in third class buildings that part which is below the sills but not more than seven (7) feet in height. It shall not be counted in determining the height of a building. On sloping lots, the mean elevation of the ground surface at the corners of the cellar shall be taken for height determination.

Section 2.113. Cement. The term cement shall mean Standard Portland Cement which meets the test specifications of the American Society for Testing Materials.

Section 2.114. Cement Mortar shall mean a mixture composed of one (1) part Portland Cement with not more than three (3) parts sand, and not more than fifteen (15) percent hydrated lime by volume.

Section 2.115. Cement Lime Mortar shall mean one (1) part Portland Cement, one (1) part hydrated lime and not more than six (6) parts of sand by volume.

Section 2.116. Church shall designate any building designed to be used, and used, as a

place of worship by any religious sect or organization.

Section 2.117. The City of Honolulu as used in this Code shall be the political district of Honolulu which extends from Maunaloa to Moanalua and from the crest of the Koolau range to the sea.

Section 2.118. **Classes of Buildings.** For the purpose of this Code buildings are classed as **First, Second and Third Class** buildings, and **Slow Burning Heavy Timber Construction** Buildings.

Section 2.118-1. **Concrete Blocks.** Precast hollow or solid blocks of concrete made in standard sizes to be laid in walls in mortar.

Section 2.119. **Curb.** Whenever the curb refers to the height of a building, the weighted mean height shall be considered of the street frontage or frontages, that is, the mean considered shall be the sum of the products of the average frontage curb elevations and their horizontal lengths divided by the total horizontal frontages, provided, however, that not more than 300 feet of frontage be considered at one time.

Section 2.120. **Curtain Walls.** Any exterior non-bearing wall between columns or piers, which is not supported by beams or girders at each story.

Section 2.121. **Dead Loads.** Dead loads shall mean the weight of the floors, walls, roofs, partitions, and all permanently attached construction.

Section 2.122. **Dwellings.** A residence building designed for use as the home of not more than two (2) separate and distinct families. A dwelling within the meaning of this Code shall include necessary out-buildings, servants' quarters and private garage therefor, and may include a private stable for not more than three (3) ani-

mals, or a separate garage with stalls for not more than four (4) cars.

Section 2.123. **Exterior Walls.** Any outside wall of a building other than a party wall.

Section 2.124. **Faced Wall.** A wall having a bonded facing which acts as an integral part of the wall.

Section 2.125. **Factory.** A building or portion thereof designed or used to manufacture, assemble goods, wares or merchandise, the work performed wholly or partly by machinery.

Section 2.125-1. **Fire Division Wall,** is a wall of masonry or reinforced concrete which subdivides a building to restrict the spread of fire, such wall beginning at the foundation and extending continuously through all stories to and above the roof.

Section 2.126. **Fire-Door.** A door frame and sill which will successfully resist fire for one (1) hour in accordance with the test specifications of the Underwriters' Laboratories. (See Section 11.600.)

Section 2.127. **Fire Limits.** Fire Limits shall mean Fire Districts Nos. 1 and 2.

Section 2.127-1. **Fire-Proof.** As used in this Code, except as elsewhere prescribed by test for particular types of construction, refers to materials or construction not combustible in the temperatures of ordinary fires, and which will withstand such fires without serious impairment of their usefulness for at least one hour.

Section 2.128. **Fire Resisting.** For the purpose of this Ordinance a five-ply felt tar and gravel, or galvanized corrugated iron roof over wood framing or sheathing, lath and plaster work, fire doors and shutters of woodwork completely covered with sheet metal which comply with sections 2.126 and 2.130 hereof when approved, wire glass, or any material of equal or greater fire-

resistive properties than these enumerated, if such is approved, shall be considered fire-resisting, and only such construction and materials of construction not combustible in the temperatures of ordinary fires and which will withstand such fires without serious impairment of their usefulness for at least one hour.

Section 2.129. **Fire Wall.** A wall which subdivides a building to prevent the spread of fire. (See Sections 9.470 to 9.474.)

Section 2.130. **Fire Window.** A window frame, sash and glazing which will successfully resist a fire for one hour in accordance with the Standard Test Specifications of the American Society for Testing Materials. (See Section 11.600.)

Section 2.131. **Foundations.** That part of a wall below the level of the highest part of the street curb, or if a wall is not on a street, that part of the wall below the level of the highest ground next to the wall or that part of a party or partition wall below the cellar floor.

Section 2.132. **Height of Buildings.** The vertical distance from the curb level to the highest point of the roof beams in the case of flat roofs, or the average height of gable in case of roofs having a pitch of over 20° with the horizontal. In case of buildings not flush with the street, the height shall be measured from the average height of the corners of the buildings. In measuring the height of a wall the height of the parapet shall not be included. (See Section 2.119.)

Section 2.133. **Hotel.** Any building or portion thereof designed or used for supplying shelter and/or food to residents or guests and containing more than 20 sleeping rooms for guests.

Section 2.134. **Lime Mortar** shall mean a composition of one (1) part slaked lime (lime putty)

or dry hydrated lime, and not more than four (4) parts sand, by volume.

Section 2.135. **Masonry.** Stone, brick, concrete, hollow tile, concrete block or tile gypsum block, or other similar building units or materials or a combination of the same, bonded together with mortar to form a structural part of a building.

Section 2.136. **Measurements of Distances.** The distance between buildings, or the distance to the lot lines shall be taken to mean the minimum distance measured horizontally from any portion of the building projected vertically giving the minimum measurement. Eaves and cornices to the extent of 2' 6" are exempt. Metal or fire-resisting ladders or stairs are exempt.

Section 2.137. **Mezzanine Story.** A partial low story introduced in the height of any story of a building which shall be not less than seven (7) feet clear height, either above or below same, if it extends more than five (5) feet from the walls of the space in which placed.

The total area of such mezzanine floor shall not exceed 50 percent of the area of the floor in the room in which such mezzanine floor is constructed. If the area of such floor exceeds the above limit it shall for the purpose of this Ordinance be considered as forming an additional story.

Section 2.138. **Natural Cement Mortar.** A mortar composed of one (1) part natural cement to not more than five (5) parts of sand, by volume.

Section 2.139. **Office Building.** A building which is intended and used for office purposes, no part of which is used for living purposes except by the janitor and his family.

Section 2.140. **Panel Wall.** An exterior non-bearing wall in skeleton construction, supported by the building frame at each floor.

Section 2.141. **Parapet Wall.** That portion of a wall which extends above the roof line and bears no load except as it may serve to support a tank.

Section 2.142. **Partition Walls.** An interior subdividing wall, other than a fire wall.

Section 2.143. **Party Wall.** A wall that separates two buildings, and which is used or adapted for the use of more than one building.

Section 2.144. **Pent Houses.** A structure erected on the roof of a building for the purpose of enclosing stairways to the roof, elevator machinery, water tanks, ventilating apparatus, exhaust chambers, or other building equipment machinery housing, or janitor's quarters. When used only for the above enumerated purposes and not exceeding 14" in height, such structures shall not be considered in determining the height of a building.

Section 2.145. **Piers.** All bearing walls of four (4) square feet or less, not bonded into adjoining walls.

Section 2.146. **Private Garage** is a building, or portion of a building, in which motor vehicles used by the tenants of the building or buildings, on the premises are stored or kept.

Section 2.147. **Public Garage** is a building or portion thereof in which motor vehicles containing gasoline, distillate or other volatile, inflammable liquid in their tanks, are stored, repaired, used or kept.

Section 2.148. **Public Hall.** A public hall is a room for public assemblages, having a total seating capacity of one hundred (100) or more persons, but which does not include a theater.

Section 2.149. **Reinforced Concrete** shall mean an approved concrete mixture in which steel or other metal is embedded in such a manner as to

resist tensile stresses, and/or add rigidity and strength to concrete in compression.

Section 2.150. **Retaining Wall** is any wall used to resist lateral displacement of any material.

Section 2.151. **Rubble, Courses.** Masonry composed of approximately squared stones fitting on level beds and well bonded.

Section 2.152. **Rubble, Random.** Masonry composed of roughly shaped stone, laid without regularity of coursing, but fitting together to form well-defined joints.

Section 2.153. **Rubble, Rough or Ordinary.** Masonry composed of unsquared field stones laid without regularity of field coursing.

Section 2.154. **Rubble Concrete.** Portland Cement Concrete in which the finer materials form a matrix for large stones and boulders.

Section 2.155. **Story.** A story is that part of a building between any floor and the floor or roof next above.

Section 2.156. **Street.** A public or private open passage, lane or right of way at least twenty (20) feet in width suitable or intended for pedestrians and vehicles. Buildings abutting public parks, beaches or similar permanently open spaces shall be considered to abut a street on such abutting side.

Section 2.157. **Structure.** Includes the terms buildings, appurtenances, wall, platform, staging or flooring used for standing or seating purposes, a shed, fence, sign or billboard on public or private property, or on, above, or below a public highway.

Section 2.158. **Tenement House or Tenement.** Shall include apartment house or apartments and shall designate any house or building or portions thereof which is designed, built, rented, leased, let or hired out to be occupied or which is occupied as the home or residence of three or

more families living independently of each other and doing their cooking in the building.

Section 2.159. **Theater.** A building containing a room for theatrical or operatic exhibitions or other public entertainments, having a total seating capacity of 300 or more persons.

Section 2.160. **Thickness of Wall** shall mean the minimum thickness of the wall exclusive of any protective covering.

Section 2.161. **Veneered Wall.** A non-bearing masonry facing covering the bearing construction.

Section 2.162. **Wire Glass.** Glass not less than one-quarter ($\frac{1}{4}$) inch in thickness enclosing a layer of wire fabric reinforcement having a mesh not larger than seven-eighths ($\frac{7}{8}$) of an inch and the size of wire not less than 24 Brown & Sharpe gauge.

Section 2.163. **Waterfront.** Shall mean the contour of the mean lower low tide.

Section 2.164. **Warehouse.** A warehouse is a building used for the storage of goods, wares or merchandise.

CHAPTER 3

CLASSIFICATIONS

Section 3.100. **Third Class Building Restrictions on Occupancy.** No third class building shall be used for any of the following occupancies:

1. Theaters.
2. Tenements, hotels, apartments, boarding houses, clubhouse, or any use other than as a private dwelling housing not more than one (1) family, if such third class building is more than two (2) stories in height. Provided, however, that the foregoing shall not apply to industrial

buildings such as crusher plants, chemical plants, elevator towers or similar industrial structures which are not for the storage of combustible materials and which have a human occupancy of not more than ten (10) people.

Section 3.200. Classification of Types of Building Construction. For the purposes of this Code buildings shall be classified into four (4) general types of construction—First, Second and Third Class, and Slow Burning Heavy Timber Construction, each of which is defined as follows:

A First Class Building is a building constructed of non-combustible materials throughout with floors and roof constructed of steel or reinforced concrete beams, filled between with terra cotta tile, or concrete, or masonry arches, or with concrete or reinforced concrete slabs and otherwise constructed as in this section provided. The outer walls shall be constructed of concrete, brick, stone, hollow terra cotta tile, concrete blocks or similar approved materials.

No woodwork or other combustible material shall be used in construction of any First Class building except wooden floors, sleepers, grounds, bucks and nailing blocks when entirely embedded in incombustible material, also the finish flooring and the interior doors and windows when not otherwise specified, with their frames, trims and casings, and also interior finish when solidly backed with fireproof material may be of wood. Finish within the meaning hereof shall include ornamental paneling or the walls when such does not exceed three-fourths ($\frac{3}{4}$) inch in thickness and is backed with fireproof material.

There shall be no air space under the finished flooring.

All exposed structural steel shall be fireproofed with cement plaster, terra cotta or other

fireproofing material as elsewhere prescribed. (See Chapter 11—Section 11.210.)

Within the Fire and Industrial Districts, First Class buildings shall be provided with fire doors and shutters or wire glass and metal frames on all exterior openings which do not abut a street. Such fire doors and shutters shall be approved. (See Fire Doors and Windows—Sections 11.600, 2.126 and 2.130. Also Chapter 7.)

A Second Class Building is a building with walls of brick, concrete, or equivalent approved masonry or fireproof material with floors and partitions of wood joist and stud construction, with all columns, walls and ceilings lathed and plastered, or protected with other equivalent fire-protective covering, the supporting posts and girders may be of protected wood or of metal protected as required by Section 11.200, with the roof covering 5-ply felt tar and gravel over wood sheathing, or corrugated iron over wood framing or sheathing or other equivalent exterior fire-resisting covering.

Within the Fire and Industrial Districts and Business Districts, Second Class buildings having exterior openings which do not face an abutting street shall be protected with approved fire doors and shutters or metal frames and wire glass. (See Fire Doors and Windows—Sections 11.600, 2.126 and 2.130. See also Chapter 7.)

Slow Burning Heavy Timber Construction. The term "Slow Burning Heavy Timber Construction" shall designate buildings having outside parapetted walls of masonry, fire doors and windows on all sides not facing a street or streets, roof of two (2) layers of full 1" lumber, laid with broken joints and covered with 5-ply tar and gravel or equivalent fire-resisting roofing and supported by beams and columns rather than trusses, with laminated floors at least 3"

in thickness, laid on heavy beams not less than 6" wide, or with fireproof floors, with no concealed spaces in the wood structural portions, with no partitions of wood, and with the stairways or elevator shafts enclosed with masonry and fire doors, and the whole construction so designed that fire may be readily hosed from outside the building and all combustible portions constructed of heavy timber to insure their slow combustion in the event of fire.

Third Class Buildings are all those not First or Second Class or Slow Burning Heavy Timber Construction as hereinbefore described.

CHAPTER 4

GENERAL BUILDING RESTRICTIONS

Section 4.100. Fire Limits. The Fire Limits of the City and County of Honolulu shall consist of Fire Districts Nos. 1 and 2, as defined in Sections 4.110 and 4.120 hereof and the Business Districts elsewhere set aside for business purposes. (See Section 5.190.)

Section 4.110. Fire District No. 1 shall include that portion of the City within the following boundaries: Commencing at a point on the waterfront where a line 100 feet waikiki from the waikiki property line of Punchbowl Street extended, and parallel to Punchbowl Street, cuts the water's edge; thence mauka and parallel to Punchbowl Street to a point 100 feet mauka of the mauka boundary of Beretania Street; thence ewa and parallel to Beretania Street to a point 100 feet ewa of the ewa property line of River Street; thence parallel to the ewa boundary of River Street to the waterfront; thence along the waterfront to the point of beginning.

Section 4.120. Fire District No. 2 shall include that portion of the City within the following boundaries: Commencing at the most southerly

corner of Fire District No. 1 near Punchbowl Street and the waterfront; thence along a line parallel to and 100 feet waikiki of the waikiki boundary of Punchbowl Street to a point 100 feet mauka of the mauka boundary of Beretania Street; thence waikiki and parallel to Beretania Street to a point 100 feet waikiki of the waikiki boundary of Alapai Street; thence makai and parallel to Alapai Street to a point 100 feet makai of the makai boundary of King Street; thence ewa and parallel to King Street to a point 100 feet waikiki of the waikiki boundary of South Street; thence parallel to South Street to the center line of Ala Moana; thence southwesterly and parallel to the U. S. Bulkhead line to the waterfront; thence along the waterfront to the point of beginning.

Again commencing at a point 100 feet waikiki of the waikiki boundary of Punchbowl Street and 100 feet mauka of the mauka boundary of Beretania Street; thence mauka and parallel to Punchbowl Street to a point 100 feet mauka of the mauka boundary of Vineyard Street; thence parallel to Vineyard Street to a point 100 feet ewa of the ewa boundary of Liliha Street; thence parallel to Liliha Street to a point 100 feet mauka of the mauka boundary of King Street; thence parallel to King Street to Palama Street; thence along the center line of Palama Street extended to a point 100 feet makai of the makai boundary of King Street; thence parallel to King Street to a point 100 feet ewa of the ewa boundary of River Street; thence parallel to River Street to a point 100 feet mauka of the mauka boundary of Beretania Street; thence parallel to Beretania Street to the point of beginning.

Section 4.130. Construction Required in Fire District No. 1. Every building hereafter to be

erected within Fire District No. 1 shall be First Class construction as defined in Section 3.200. Provided, however, that buildings without walls may be erected as provided in Section 4.500. Buildings extending into another district shall be of the construction required in the more stringently regulated district, unless a division fire wall is constructed making, in effect, two separate buildings. In addition to the above restrictions, all buildings shall conform to the requirements of height, area of lot covered, fire pipe lines, fire escapes, and structural requirements elsewhere provided for in this Code. (See particularly Sections 3.200, 4.430 and Chapter 7.) This Section shall be construed to affect existing buildings when the alterations on such total more than one hundred percent (100%) of the assessed value of the structure in the case of Second Class buildings and slow burning heavy timber construction buildings, and fifty percent (50%) of the assessed value of the structure in case of Third Class buildings. The assessed value used shall be that for taxation purposes and shall be taken just prior to the proposed repairs. When the total of all repairs exceed the above, such structure shall be made to entirely conform to the requirements of this Section, or shall be removed.

Provided further, that when any part of an existing building is taken for public use by condemnation, or otherwise, it shall be lawful to repair the remaining portion of such building with materials similar to those with which the building was originally constructed.

Provided further, that nothing in the foregoing requirements for First and Second Class buildings within Fire District No. 1 and Fire District No. 2 shall be construed to affect Third

Class temporary buildings to be erected in accordance with the following requirements:

1. Permits for such structures shall expire thirty (30) calendar days from the date of issue.

2. Such structures shall be confined to open lots, parks or similar open spaces and shall not be closer than thirty (30) feet to the nearest existing structures.

3. Such structures shall be so constructed and maintained as to reduce the probability of fire to a reasonable minimum and shall be subject to the approval of the Superintendent of Buildings of the City and County of Honolulu, and shall conform to the requirements of structural safety provided in this Code.

Section 4.140. Construction Required in Fire District No. 2. Within Fire District No. 2, every building hereafter erected shall be of First Class, Second Class, or Slow Burning Heavy Timber Construction, as defined in Section 3.200, provided, however, that buildings without walls may be erected as provided in Section 4.500. Buildings extending into another district shall be of the construction required in the more stringently regulated district, unless a division fire wall without openings is constructed, making, in effect, two separate buildings. In addition to the above, all buildings shall conform to height restrictions, area of building without fire walls, area of lot covered, fire pipe lines, fire escapes and structural requirements as elsewhere provided for in this Code. Provided, however, that this Section shall be construed to affect existing nonconforming buildings when the alterations on such total more than fifty percent (50%) of the assessed value of the structure just prior to the proposed alterations, in which event the owner shall make the entire building conform to the requirements of this Chapter and/or remove

the structure or adopt such other procedure as may conform to the intent of this Section.

Section 4.150. Class of Buildings in Districts Outside the Fire Limits. Within Industrial Districts Nos. 1 and 2 of the City and County of Honolulu, buildings may be First, Second or Third Class Buildings, or Slow Burning Heavy Timber Construction, but subject, however, to the spacing, area and height or other applicable requirements elsewhere in this Chapter. (For spacing see Section 4.330; for height see Section 4.200; and for definitions of classes of buildings see Section 3.200.)

Section 4.200. Height Restrictions. No building or structure hereafter erected, except church spires, water towers, clock towers, smokestacks or chimneys, shall exceed in height twice the width of the widest street upon which it fronts within Fire District No. 1 or one and one-half times the width of the widest street upon which it fronts in Fire District No. 2 and Industrial Districts Nos. 1 and 2, or once the width of the widest street upon which it fronts within the remainder of the City of Honolulu, nor shall the height exceed the following limits:

	Height	
	Stories	in feet
Frame buildings used for purposes other than a single dwelling.....	2	30
Frame dwelling occupied by not more than one family.....	3	35
Buildings having bearing walls of hollow terra cotta building tile or concrete blocks (See Section 9.421)	4	50
Second Class Buildings.....	4	55
Slow Burning Heavy Timber Construction	5	65
First Class Buildings.....	6	80

If a single story building exceeds thirty (30) feet in height the roof shall be fire-resisting.

A single story building not exceeding thirty (30) feet in height may have a skylight not exceeding ten (10) feet in height. Provided that additional height on First Class buildings will be permitted above the height limit of eighty (80) feet provided such additional construction is not intersected by any line making an angle of thirty (30) degrees with the vertical and originating from the height limit of eighty (80) feet on the exterior walls.

Section 4.300. Area Restrictions, First Class Buildings. The minimum floor area between fire walls or exterior walls shall not exceed the following:

(1) All First Class buildings used for public gatherings, light and power stations, office buildings, machine shops, foundaries, factories, and other similar buildings, where little or no inflammable material is stocked or kept, no restrictions as to area.

(2) All other First Class buildings shall not exceed the following areas:

	Without Sprinklers	With Sprinklers
Fronting on One street	10,000 sq. ft.	16,666 sq. ft.
Two streets	12,000 sq. ft.	20,000 sq. ft.
Three or more streets..	15,000 sq. ft.	25,000 sq. ft.

(3) The first floor only of any First Class building occupied as a retail store may have an area 20,000 square feet and if protected with automatic sprinkler, 30,000 square feet.

Section 4.310. Floor Area Restrictions, Second Class Buildings. The maximum floor area between fire walls or exterior walls of any Second Class building shall not exceed the following:

- (1) Tenement houses.....3,000 square feet
- (2) All other Second Class buildings—

Fronting on	Without Sprinklers	With Sprinklers
One street	5,000 sq. ft.	8,333 sq. ft.
Two streets	6,000 sq. ft.	10,000 sq. ft.
Three streets	7,500 sq. ft.	12,500 sq. ft.

(See Section 5.193 on Hotels and Apartments.)

Section 4.320. **Floor Area Restrictions, Slow Burning Heavy Timber Construction Buildings.** The maximum floor area between fire walls or exterior walls of any slow burning heavy timber construction building shall not exceed the following:

Fronting on	Without Sprinklers	With Sprinklers
One street	6,500 sq. ft.	13,000 sq. ft.
Two streets	8,000 sq. ft.	16,000 sq. ft.
Three streets	10,000 sq. ft.	20,000 sq. ft.

Section 4.330. **Floor Area and Height Restrictions for Third Class Buildings Within the Industrial Districts.** Third Class buildings within Industrial Districts Nos. 1 and 2 shall be built in accordance with the following areas and corresponding interior line distances; except as provided in (f).

Distance to nearest interior lot bound- ary	Distance to nearest building on same lot—feet	Fronting one street —sq. ft.	Fronting on two streets—sq. ft....	Fronting on three or more streets— sq. ft.
5 feet.....	10	1,000	2,000	3,000
10 feet.....	20	2,000	4,000	6,000

(a) In the foregoing table, the minimum distances and areas are given, and whichever distance from either lot or boundary or the nearest building gives the lesser corresponding area, that distance shall govern.

(b) No Third Class building within Industrial Districts Nos. 1 and 2 shall be closer than

five (5) feet to any interior lot boundary, or within ten (10) feet of any other building, nor shall it exceed 6,500 square feet in area except as provided in paragraphs (d), (e) and (f).

(c) Any Third Class building may be built on any street property line provided the allowable area does not exceed the requirements of paragraph (a) of this Section for distance from the nearest buildings.

(d) Any Third Class building within Industrial Districts Nos. 1 and 2 may be increased sixty-six and two-thirds percent ($66\frac{2}{3}\%$) in area if equipped with approved automatic sprinkler systems.

(e) Third Class buildings within the Industrial Districts may be constructed adjacent to each other provided the sections are separated with a fire wall extending three (3) feet above the roof and six (6) inches on the sides with all openings protected with approved fire doors, and provided, further, that the floor area of any section shall not exceed 2,300 square feet nor shall any part of the structure be nearer than fifteen (15) feet to any interior lot boundary, nor shall it be over one (1) story, or thirty (30) feet in height, nor shall such adjacent structure be used as a tenement, apartment, or dwelling or living quarters.

(f) Buildings of corrugated iron on steel frames which contain no wood partitions or other combustible material in their construction, and which house non-combustible materials, or are to be used and used as factories, machine shops, foundries, canneries, or other uses in which little or no combustible materials are contained, may be constructed within the Industrial District in accordance with the following table: provided, however, that the maximum size of

such buildings shall not exceed 60,000 square feet or one story in height.

Distance to nearest interior lot boundary—feet	Distance to nearest building on same lot—feet	Fronting on one street—sq. ft.	Fronting on two streets—sq. ft.	Fronting on three or more streets—sq. ft.
5 (minimum)	10 (minimum)	10,000	20,000	30,000
10	20	20,000	40,000	60,000

Buildings constructed as above but which have all exterior walls constructed as required for First Class buildings, with all openings therein protected with fire doors and shutters, and which walls are parapetted above the roof, may be constructed as above provided excepting that the walls of such building may be placed on the lot boundary line.

The foregoing areas may be increased sixty-six and two-thirds (66 2/3) percent if equipped with approved automatic sprinkler system.

Note: See definition of Street, Section 2.156.

Section 4.340. Restrictions on Third Class Buildings Outside the Fire and Industrial Districts.

(a) Outside the Fire and Industrial Districts the areas of the Third Class buildings and distances of said buildings from interior lot boundaries shall be as follows:

One Story Not Over 30 Feet in Height.

Distance to nearest interior lot boundary—feet	Distance to nearest building on same lot—feet	Fronting on one street—sq. ft.	Fronting on two streets—sq. ft.	Fronting on three or more streets—sq. ft.
5	10	1,000	2,000	3,500
10	15	2,000	3,500	6,000
15	20	3,500	6,000	8,000
20	25	6,000	8,000	10,000

More Than One Story in Height

10	15	1,000	2,000	3,500
15	20	2,000	3,500	6,000
20	25	3,500	6,000	10,000
25	30	6,000	10,000	10,000
30	35	10,000	10,000	10,000

(b) No Third Class building in the City and County of Honolulu and outside the Fire and Industrial Districts shall exceed 10,000 square feet in area nor shall the same be nearer any interior lot boundary than the minimum distances in the preceding tables, except that garages and servants' quarters not exceeding 800 square feet or one story in height may be placed on the rear lot boundaries if such is approved.

Section 4.400. Restrictions on Building on Interior Lots.

(a) No building which does not face a street for a distance of one complete dimension of the building shall be in excess of the following table of allowable heights and areas:

District	2nd Class Bldgs. Max. Height, Story Max. Area, sq. ft.	3rd Class Bldgs. Max. Height, Story Max. Area, sq. ft.
Fire Dist. No. 1	Not permitted	Not permitted
Fire Dist. No. 2	2-30 ft. 5,000	Not permitted
Industrial Dist.		
Nos. 1 and 2	2-30 ft. 5,000	1-25 ft. 1,500
Remainder of City of Ho- nolulu	2-30 ft. 5,000	1-25 ft. 1,500

Buildings shall be considered to face a street if no structure other than a fence not over eight (8) feet high exists between such building and the street. (See Section 2.156 for definition of street.)

(b) No Third Class building shall be con-

structed on an interior lot over one story or 30 feet in height.

(c) In the case of a deep lot which allows the construction of several buildings, but abuts a street, all portions of the lot beyond a line seventy-five (75) feet back from the street property line and which does not have a direct fronting on the street, shall be for the purpose of this Chapter considered as an interior lot, and all buildings erected thereon shall comply with the requirements for an interior lot.

(d) Every building on an interior lot shall be provided with an unobstructed minimum passage of five (5) feet for the occupants of such building or buildings thereon and an additional one (1) inch width for each ten (10) persons over fifty (50) persons who occupy or for whom accommodations are provided by such building or buildings. A single apartment or dwelling shall be considered to accommodate five (5) persons.

Section 4.410. Further Restrictions as to Location on Property. In addition to the foregoing spacings applicable to the Fire Limits, Industrial Districts and Interior lots, no building shall hereafter be erected within the Residential Section of the City of Honolulu nearer than five (5) feet to any interior lot boundary provided that:

(a) **Garages and Servants' Quarters** not exceeding an area of 800 square feet or one story in height may be constructed on the rear property line if such is approved by the affected property owners and is approved by the Superintendent of Buildings.

(b) **Garages on the Joint Boundary** of two owners may be erected (if mutually agreed in writing, which agreement shall be attached to the permit application), but shall not exceed

one story in height or 800 square feet of area on each side of the common boundary. All garages shall have fireproof floors.

Section 4.420. Cornices and Wall Projections. Cornices, belt courses and all similar facings on all First and Second Class buildings shall be non-combustible, well anchored and so designed that facings will not be shaken from the backing. All anchors of facings, cornices, tile or similar veneers for such purpose shall be of copper, bronze or other corrosion-resisting metal, or iron and steel completely enclosed with not less than one (1) inch of dense concrete protective covering. All such belt courses, bays, or any other facing projections shall not exceed twelve (12) inches beyond the street property line, except that eaves not to exceed four (4) feet beyond the street property line may be constructed. Such projections shall be less than five (5) percent of the area of the wall face, provided, however, that awnings as provided by Section 4.430 shall be excluded.

Section 4.430. Awnings and Marquee Awnings are permissible in all districts, provided that such are not less than nine (9) feet above the sidewalk, clear measurement, and provided further that within the fire limits such are constructed entirely of non-combustible materials. All awnings shall be securely braced and anchored and shall conduct the rainwater therefrom in to the building line, and under the sidewalk to the gutter.

Awnings and marquee awnings, in order that public utility poles may be placed inside the inner curb face, shall be so constructed that the supporting beams or purlins which parallel the curb at the outer edge of the awning shall be placed not nearer than two (2) feet to the inner edge of the curb projected vertically.

Section 4.440. **Canvas Awnings.** No combustible awning shall be constructed on the interior wall lines of any building in the fire limits.

Section 4.450. **Minimum Spacing Requirements in all Districts.** Except as hereinbefore provided, all buildings except theaters, special industry buildings and tenement houses shall have uncovered spaces for providing light and air. These spaces shall be open to the sky from the top of the second story window sill and shall be in accordance with the following provisions:

(1) Rooming Houses, Club Houses, Hotels and Lodging Houses on lots other than corner lots:

20% of total lot area.

(2) Buildings as enumerated in provision (1) on corner lots:

15% of total lot area.

(3) All buildings not enumerated in provisions (1) and (2) on lots other than corner lots:

10% of total lot area.

(4) All buildings not enumerated in provisions (1) and (2) on corner lots not exceeding 2,500 square feet in area:

5% of total lot area.

(5) When buildings are on corner lots more than 2,500 square feet in area, that portion of the building upon the excess lot area over and above 2,500 square feet shall be provided with open spaces in accordance with the requirements of provisions (1), (2) and (3), as the case may be, of this Section.

(6) Every building other than buildings enumerated in paragraph (2) which occupies lots fronting on three (3) or more streets may occupy the entire lot area.

(7) The total area of the uncovered spaces of all buildings which are more than seventy-five (75) feet in width and occupy the entire

block front facing upon three (3) or more streets may be less by twenty-five (25) percent than required by provisions (3), (4), (5) and (6) of this Section.

(8) There shall be a clear space not less than five (5) feet in width at and above the second-story window sills between the rear line of every building and rear lot except corner lots. This shall not apply to buildings which extend through from one street to another.

(9) In every court or yard the minimum width between walls shall be five (5) feet.

(10) Additions to existing buildings shall be considered together with the original construction as only one complete unit for space requirements.

Section 4.500. Sheds and Buildings Without Walls. Within any district garage sheds consisting of metal roofing and supports will be permitted—one (1) story or twenty (20) feet in height, the sides of which are open and the interior exposed. Such sheds may have one (1) wall of masonry. On the exposed sides there shall be a clear space of not less than ten (10) feet between the edge of the eaves and any other structure. The exposed sides shall not be enclosed with metal wire or other obstruction, but shall be kept entirely open. No such shed shall be wider than twenty-five (25) feet, but may be any length.

CHAPTER 5

ZONING

Section 5.100. **Use Districts.** For the purpose of this Code the City of Honolulu, as defined in Chapter 2, is divided into the following Use Districts:

1. Industrial Districts.
2. Noxious Industry Districts.
3. Business Districts.
4. Hotel and Apartment Districts.
5. Residence Districts, single or multiple dwellings.
6. Residence Districts for single family dwellings.

Section 5.110. **Industrial Districts.** Within the Industrial Districts as defined by Chapter 2 of this Code, all classes of uses are permitted with the exception of noxious industries as hereinafter defined.

Section 5.120. **Noxious Industry Districts.** Within the Noxious Industry Districts any use is permitted excepting any building which is designed, arranged or intended to be used in whole or in part as a dwelling, hotel, lodging house, boarding house or tenement, or for any living quarters with the exception of one dwelling upon a premises for a watchman and his family. The term noxious industry shall be taken to include such industries as fertilizer works, soap works, fish canneries, glue works, chemical plants which emit noxious fumes, asphalt plants, gas works, creosote treatment plants, tanning works, slaughter houses, crematories, lime kilns, or any works or plants which emit noxious or offensive odors, fumes, gas or excessive smoke.

Section 5.130. **Business Districts.** Within the Business Districts, any use is permissible except-

ing noxious industry and industrial uses. The term Industrial uses shall be taken to include such uses as boiler and steel works, planing mills, lumber yards, foundaries, ship works, canneries, oil storage plants, factories and machine shops employing more than five (5) people, and all such works other than noxious industries as defined in Section 5.120 hereof.

Section 5.140. Hotel and Apartment Districts. Within the Hotel and Apartment Districts, any use is permitted excepting noxious industry, industrial uses, and business uses. The term Business uses shall be taken to include all retail and wholesale stores, shops, public garages, blacksmith shops, milk depots, gasoline service stations, restaurants except in hotels or apartments, amusement houses, theaters, moving picture shows, dance halls, undertaking parlors, automobile sales rooms, automobile repair shops, small carpenter shops, office buildings, and similar uses other than industrial uses and noxious industries as defined in Sections 5.120 and 5.130 herein.

Section 5.150. Residential Districts. Within the Residential Districts only dwellings, boarding houses, buildings for truck and flower gardens, greenhouses, hospitals, sanitariums, churches, schools and publicly owned buildings shall be erected or used.

Section 5.160. Single Family Residence Districts. Within the Single Family Residence Districts only single family dwellings and publicly owned buildings shall be erected or used. A single family dwelling shall include the same accessory buildings permitted for dwellings as defined in Chapter 2.

Section 5.170. Non-Conforming Buildings and Uses. Any building being used at the present time in non-conformity with the requirements

of this Code may continue such use, but any use now existing in non-conformity with this Code shall not be changed into a different non-conforming use.

Section 5.180. Method of Applying for Restricted Use Districts. If the owners of property within any area desire a change in the use now existing of any district or portion thereof, other than as provided for Business Districts as provided in Section 5.190, they shall present a petition upon forms to be prescribed by the City Planning Commission, accompanied by a map showing the property involved, and the owners and the areas involved, to the City Planning Commission. Such petition shall present the reasons therefor, and the area desired to be altered by the petitioners. Except in the case of business districts to be set aside within the residential districts, as hereinafter provided, such area shall not be less than 50,000 square feet. The Planning Commission shall as soon as possible pass upon such application, considering the desirability and need for the orderly development of the City, and submit their recommendations thereon to the Board of Supervisors for such action as may be advisable.

Section 5.190. Business Districts in Residential Sections. In the Residential Districts, Business Districts, Hotel and Apartment Districts may be reverted to Residential Districts, by a petition signed by seventy-five (75) percent of the property owners within a radius of seven hundred and fifty (750) feet of the center of the street front of the proposed district if such petition be granted by the Board. Leased property, the unexpired term of which is five (5) years or more, to be considered shall require the signature of both the owner and lessee, which shall be construed one signature for the purpose of comput-

ing the percentage of consent. All new districts shall be as nearly rectangular as practicable in shape, abut a public street and shall be one hundred (100) feet in depth from the street boundary where possible. Such petition shall be on forms furnished by the City Planning Commission, with whom such petition shall be filed in duplicate, and the sum of one hundred dollars (\$100.00) paid the Treasurer of the City and County for publishing and posting of notices, which posting shall be done by the City Planning Commission at least every two hundred (200) feet within the proposed district, and published at least two (2) times within ten days in a paper published and of general circulation in the City of Honolulu. Such notices shall set forth all the requisite facts and set a date of public hearing before the Planning Commission not sooner than ten (10) days from the first publishing and/or posting of such notices. At such public hearing the City Planning Commission shall note all protests and suggestions offered. Names may be added to or withdrawn from the petition up to the close of the public hearing. The Planning Commission shall thereupon consider the petition, if such is still supported by seventy-five (75) percent of the property owners, with particular reference to the orderly development of the City, and shall, if favorable action be determined, prepare an ordinance with the assistance of the City and County Attorney covering the matter and forward such, together with a report on the entire proceedings and their recommendations, to the Board for such action as may be deemed proper.

In determining the percentage of consent, all public areas shall be deducted from the total area and all owners of property already using property for the purposes asked for in the peti-

tion shall be considered as having signed the petition in consent.

Section 5.191. Planning Commission to Recommend Changes in Use Districts. The City Planning Commission shall recommend from time to time, either with or without petitions therefor, any changes, extensions, retractions, corrections, adjustments or alterations that may appear to them desirable for the orderly development of the city, to the Board of Supervisors for such action as may be deemed advisable.

Section 5.192. Business Districts to Become Part of Fire District No. 2. All districts set aside for business purposes shall become subject to the regulations and privileges applicable to, or to become applicable to, Fire District No. 2, provided that metal automobile service stations containing little or no wood with metal roof and sides may be constructed in such districts providing that such building is not nearer than twenty (20) feet from any other building on the same lot, or nearer any interior lot boundary than twenty (20) feet. (Note: No spacing is required within the fire limits on the side lines of the lot.)

Section 5.193. Hotel and Apartment Districts Limitation.

SECOND CLASS BUILDINGS.

Within the Hotel and Apartment Districts, second class buildings for hotels and apartments may be constructed with any multiple of the allowable areas given in the preceding tables for second class buildings, adjacent to each other, provided a masonry or concrete fire-division wall subdivides such areas.

THIRD CLASS BUILDINGS.

Within the Hotel and Apartment Districts, single third class buildings for hotels and apartments shall be not more than two (2) stories

in height, nor shall the same be nearer any interior lot boundary than the minimum distance given in the preceding tables of allowable areas.

(Note: For district boundaries of business districts, hotel and apartment districts, see maps and ordinances in the office of the Superintendent of Buildings.)

CHAPTER 6

LIGHT AND VENTILATION.

Section 6.100. **Light and Ventilation of Dwellings.** Each and every room intended or used for habitation shall be provided with at least eight (8) square feet of window area having unobstructed access into the open air for each one hundred (100) square feet of floor space in said room, and free access shall, at all times, be had to the same by the occupants of the room; and at least one-half ($\frac{1}{2}$) of such window space shall be movable and available for ventilation. No room designed or used for sleeping purposes shall have less than seven (7) feet clear space between the floor and the ceiling for at least $\frac{2}{3}$ of its area, nor shall any such ceiling be less than five (5) feet above the average ground elevation adjoining such rooms.

Section 6.110. **Ventilation of Water Closets and Urinals.** Every apartment or room containing a water closet or urinal shall be properly ventilated by means of a window opening directly into the open air, provided, however, that an interior room containing a water closet or urinal may be constructed if such room be ventilated by a positive mechanical system in such a manner as to completely change the atmosphere of such room at least six (6) times each hour.

Section 6.120. **Light Courts.** Narrow courts or shafts for light and ventilation shall in no case be less than four (4) feet between walls. All openings into such courts in first and second class buildings shall be protected by metal frames and wire glass.

Section 6.130. **Ventilation of Attics, Basements and Cellars.** No second or third class building shall be so constructed that unventilated spaces are left below the ground floor or above the ceiling.

Section 6.140. **Air Space Under Buildings.** Every building shall have at least twenty (20) inches of clear air space between the bottom of the floor joists and the top of the highest point of the ground, and shall be opened and cleared to a free access of fresh air and light at all times. This space shall not be excavated except in cases of full basements and cellars or in free draining soil. Provided, however, that floors of masonry tile or similar construction with or without wood surfacing may be used if such is so constructed that no pockets exist which might become rodent harbors or vermin infested.

Section 6.150. **Outside Districts.** Outside the City of Honolulu as defined in Chapter 2, no third class building shall be constructed nearer than five (5) feet to the property line, or ten (10) feet to the next nearest building on the same lot or of greater height than two (2) stories if used for other than industrial uses. Provided, however, that single family residences may be three (3) stories in height. Theaters, public assembly halls, and moving picture show houses shall be subject to the same regulations for seating, exits, fire protection, and other regulations pertaining to theaters and moving picture houses within the City of Honolulu.

CHAPTER 7

MEANS OF EGRESS

Section 7.100. Stairways.

1. **First and Second Class Buildings** which are three (3) or more stories in height shall have at least two (2) stairways, except as provided hereafter, not less than thirty (30) inches wide each for the first fifty (50) occupants and one (1) additional inch of width for each ten (10) additional occupants. These stairways shall be entirely enclosed with masonry fire walls of not less than eight (8) inches of masonry; shall be protected at each floor, except the street entrance, which may be left open, with self-closing fire doors which shall open with the direction of exit and shall be unfastened except that panic bolts may be used; shall continue up to and enter upon the roof, but the last flight from the top floor to the roof may be constructed with a metal ladder; and these stairways shall be built of first class construction. One of these stairways shall enter into a street, but the other may enter into a rear court or other space deemed adequate for the occupants by the Superintendent of Buildings. One of such stairways shall have a standpipe as provided in Section 11.910. Provided, however, that for first and second class warehouses, and other uses not for human occupancy, and for all first and second class buildings not over two (2) stories in height and not over 4,000 square feet in area, only one (1) such stairway shall be required, and further provided that horizontal exits constructed by means of fireproof balconies which lead around a party or fire wall, and the entrances to which are protected with fire doors, may be deemed equivalent of a stairway as re-

quired herein. Horizontal exits may be recessed into the building if the outer wall is open to the outer air, or other construction, so as to obtain the same insolation as with the balcony above described. All balconies, stairs, landings and platforms required by this Section shall be designed for a live load of one hundred (100) pounds per square foot, and shall be protected with substantial metal or masonry railings. (See Section 11.211, provisions 6 and 7.)

2. **Third Class Buildings** of two (2) stories, other than single family dwellings and which are designed to, or do, accommodate more than five (5) persons on the second floor, and all two-story third class tenements, apartments, rooming houses, boarding houses and hotels shall be provided with not less than two (2) stairways, so located that no matter in which portion of the building fire might occur, one stairway shall be available to any occupants. These stairways shall lead to the ground floor and shall be not less than thirty (30) inches in width each, with an additional one (1) inch for each person over ten (10) persons to be accommodated on the second floor; horizontal exit may be used in lieu of one of these stairways.

Section 7.110. Entrances to Stairways and Smokeproof Towers. All entrances to stairways as required by Section 7.100 shall be so proportioned as to be adequate for their portion of the stair width required, but in no case shall such doors be less than thirty-six (36) inches in width.

Such entrances shall be so constructed that access is made available by an opening leading from the floor or story to an outside balcony, from which balcony another door leads into the stairway. The stairway shall be completely enclosed by eight (8) inch fire walls excepting on

the outside, which shall be open to the outer air. Doorways shall be protected with fire doors. Instead of the balcony herein provided, a recessed stair well may be used, provided, however, that an additional fire wall be constructed to enclose the stairway, with a fire door leading from the floor to the ante-chamber thus formed, and a second fire door leading into the stairways. The outside of the stair well shall be open to the outer air.

No openings except to the street, or street side, or court at least twenty (20) feet wide, shall be constructed into stairways in first and second class construction other than the fire doors provided in Section 7.100. Such stair wells, however, may be provided with skylights at the top.

Section 7.200. Fire Escapes. Every existing building of three (3) stories or more in height shall be provided with adequate fire escapes, so located that no matter in what portion of the building fire might occur, at least one stair or fire escape shall remain readily accessible to the occupants. Fire escapes shall be galvanized steel located on the exterior of the building, or enclosed, or horizontal, as described in Section 7.100. Every fire escape shall reach to the ground on the sides and rear, and not higher than the first story ceiling on street fronts, and shall continue up to and over the roof, and shall be maintained unobstructed, safe and readily accessible to every floor of the building. Fire-fighting pipe lines shall be constructed on every fire escape as described in Section 11.910. All types of fire escapes shall be designed to safely sustain a live load of one hundred (100) pounds per square foot of available space. (Note: For Theater exits see Section 13.100.)

Section 7.300. Exit Doors. All exit doors in all buildings except dwellings shall open outwards, provided, however, that this requirement shall not prohibit the use of doors which swing inwards and outwards, nor of sliding or rolling doors in wharves, warehouses, shipping rooms and in industrial and mercantile buildings, where conditions make such necessary, or the ground floor of stores which do not exceed 5,000 square feet in area.

The width of opening of exit doors shall be as required for stairs and as stipulated in Section 7.100 (1).

Every room having an occupancy of more than seventy-five (75) persons shall have at least two (2) doorways four (4) feet in the clear, remote from each other, leading to exits. (Note: For theater exits see "Theaters".)

Section 7.400. Exit Lights. In all hotels, rooming houses, dormitories, or other buildings two (2) or more stories in height furnishing sleeping accommodations for more than twenty-five (25) persons, all fire escapes and exits shall be plainly marked by signs having the word "exit" written in letters at least three (3) inches high, which sign shall be illuminated at night, on a separate circuit from the building mains. (See Section 13.100 for Theater Exit Lights.)

CHAPTER 8

MATERIALS, LOADS AND STRESSES.

Section 8.110. Quality of Materials. All building materials shall be of a quality and standard to meet the requirements of this Code and such tests as may be deemed necessary by the Superintendent of Buildings. In establishing standards for materials, the Superintendent shall be

guided largely by the standards established by the American Society for Testing Materials, and recognized good practice in methods and results.

Section 8.111. **All tests shall be conducted under the supervision and direction of the Superintendent of Buildings.** Laboratory tests shall be made at some testing laboratory of recognized standing by a competent and disinterested expert acceptable to the Superintendent of Buildings. Tests shall be at the expense of the owner or builder. Certified copies of the results of all tests shall be kept on file in the office of the Superintendent of Buildings and shall be open to public inspection. The Superintendent of Buildings may, in his discretion, accept certified copies of tests made by reputable persons in lieu of tests conducted under his direction, but in either event the requirements of this Code shall be satisfied.

Section 8.112. **Brick.** Brick shall be sound, hard burned, or other approved brick of regular shape. Used brick shall be thoroughly cleaned before re-using. Not more than fifteen (15) percent shall be bats or broken brick. All brick intended for uses where strength is required shall test an average of 3000 lbs. per square inch, and no sample shall fall below 2000 lbs. per square inch, tested flat (half bricks permissible) and the average obtained on at least five (5) samples.

Section 8.113. **Sand.** Sand shall be clean coral, beach or crushed rock sand.

Section 8.114. **Lime** shall be the standard lime of commerce, or fresh burned quicklime free from deleterious matter.

Section 8.117. **Concrete.** Portland Cement concrete shall be so proportioned, mixed and placed that the uses for which it is intended shall be safely satisfied. The mixing, handling

and placing shall be carried out by persons of sufficient competency to insure results within the structural requirements of this Code and such additional tests as may be deemed necessary by the Superintendent of Buildings.

Section 8.118. **Lumber.** All lumber used shall be structurally adequate to serve the purposes intended within the safety factors required by this Code. No lumber shall be used in any building which is infected with dry rot, or termites.

Under no circumstances shall any lumber which is infected with wood-boring insects be used in any building. All such material shall be either disinfected to the satisfaction of the Superintendent of Buildings or burned. No such infected lumber shall be transported excepting as may be necessary for disinfection or destruction.

Section 8.119. **Wrought Iron** shall be taken to mean either the true puddled wrought iron or the mild steel usually sold as such with a tensile resistance of not less than 48,000 lbs. per square inch, and shall be fibrous, tough and ductile.

Section 8.120. **Cast Iron** shall be a good foundry mixture producing a clean, tough gray iron. Castings shall be free from cold shuts, blow holes, and shall conform to the standard test requirements of the "Arbitration Bar" of the American Society for Testing Materials. With the bar supported on twelve (12) inch centers, and loaded in the middle, the breaking load shall be not less than 2900 lbs.

Section 8.121. **Steel.** All **Rolled Structural Steel** shall have an ultimate tensile strength of not less than 64,000 lbs. per square inch. **Rivet Steel** shall have an ultimate strength not less than 45,000 lbs. per square inch. **Reinforcing Steel** for concrete shall meet the require-

ments of the current standard specifications of the American Society for Testing Materials for Billet Steel Concrete reinforcing bars. No reinforcing steel produced from re-rolled material shall be used without the approval of the Superintendent of Buildings. Cold drawn steel wire made from open hearth billets or from Bessemer billets may be used as reinforcement in floor and roof slabs and column hooping; and as reinforcement for temperature and shrinkage stresses. It shall have an ultimate strength of not less than 85,000 lbs. per square inch and shall bend 180° upon its own diameter without fracture.

Section 8.200. Loads, General. Buildings and all parts thereof shall be of sufficient strength to support safely their imposed loads, live and dead, in addition to their own proper dead load, provided, however, that no building or part thereof shall be designed for live loads less than those specified in the following sections.

Section 8.210. Dead Loads. For the purpose of this Code, the following weights shall be taken for the materials listed. Actual tests may be used for these or other materials as provided in Chapter 8 hereof.

Brickwork, burned brick.....	120 lbs. per cu. ft.
Brickwork, cement brick.....	150 lbs. per cu. ft.
Concrete, stone and sand....	150 lbs. per cu. ft.
Dense blue lava stone.....	170 lbs. per cu. ft.
Oak	50 lbs. per cu. ft.
Douglas fir	35 lbs. per cu. ft.

Section 8.220. Live Loads. Human Occupancy.

(1) For rooms of private dwellings, hospital rooms and wards, guest rooms in hotels, lodging houses and tenement houses, and for similar occupancies, the minimum live load shall be taken as forty (40) pounds per square foot uniformly

distributed, except that where floors of one and two family dwellings are of monolithic type or of solid or ribbed slabs, the live load may be taken as thirty (30) pounds per square foot.

(2) For floors for office purposes and for rooms with fixed seats, as in churches, school classrooms, reading rooms, museums, art galleries and theaters, the minimum live load shall be taken as fifty (50) pounds per square foot uniformly distributed. Provisions shall be made, however, in designing office floors for a load of 2,000 pounds placed upon any space $2\frac{1}{2}$ feet square wherever this load upon an otherwise unloaded floor would produce stresses greater than the fifty (50) pound distributed load.

(3) For aisles, corridors, lobbies, public spaces in hotels and public buildings, banquet halls, assembly halls without fixed seats, grandstands, theater stages, gymnasiums, stairways, fire escapes, or exit passageways, and other spaces where crowds of people are likely to assemble, the minimum live load shall be taken as 100 pounds per square foot uniformly distributed. The requirements shall not apply, however, to such spaces in private dwellings, for which the minimum live load shall be taken as in Paragraph 1 of this Section.

Section 8.221. Industrial or Commercial Occupancy. In designing floors for industrial or commercial purposes, or purposes other than previously mentioned, the live load shall be assumed as the maximum caused by the use which the building or part of the building is to serve. The following loads shall be taken as the minimum loads permissible for the occupancies listed, and loads at least equal shall be assumed for uses similar in nature to those listed in this Section.

Floors used for	Minimum Live Load lbs. per. sq. ft.
Storage purposes, general.....	250
Storage purposes, special.....	200
Manufacturing, light	75
Printing plants	100
Wholesale stores (light merchandise)....	100
Retail sales rooms (light merchandise)	75
Stables	75
Garages:	
All types of vehicles	100
Passenger cars only.....	60

Sidewalks: 250 pounds per square foot or 800 pounds concentrated, whichever gives the greater shear.

Section 8.222. **Roof Loads.** Roofs having a rise of four (4) inches or less per foot of horizontal projection shall be proportioned for a vertical live load of thirty (30) pounds per square foot of horizontal projection, applied to any or all slopes. With a rise of more than four (4) inches and not more than twelve (12) inches per foot, a vertical live load of twenty (20) pounds per square foot on the horizontal projection shall be assumed. If the rise exceeds twelve (12) inches per foot, no vertical live load need be assumed, but provision shall be made for a wind force acting normal to the roof surface of twenty (20) pounds per square foot. Varying slopes shall be considered independently.

Section 8.223. **Allowance for Movable Partition Loads.** Floors in office and public buildings, and in other buildings subject to shifting of partitions without reference to arrangement of floor beams or girders shall be designed to support, in addition to other loads, a single partition of the type used in the building, placed in any possible position.

Section 8.224. **Reductions in Live Loads.** Except in buildings for storage purposes, the following reductions in assumed total floor live loads are permissible in designing all columns, piers or walls, foundations, trusses, and girders.

Reduction of Total Live Load Carried:

	Per Cent
Carrying one floor.....	0
Carrying two floors.....	10
Carrying three floors.....	10
Carrying four floors.....	30
Carrying five floors.....	40
Carrying six floors.....	45
Carrying seven floors or more.....	50

For determining the area of footings the full dead loads plus the live loads, with reductions figures as permitted above, shall be taken, except that in buildings for human occupancy, listed hereinbefore, a further reduction of one-half ($\frac{1}{2}$) the live load as permitted above may be used.

Section 8.225. **Live Loads to be Posted.** The live loads for which each floor, or differing parts thereof, of a commercial or industrial building other than an office or similar building is designed shall be certified by the Superintendent of Buildings and shall be conspicuously posted in that part of each story where they apply, using durable metal signs. It shall be unlawful for any person to occupy a building until a certificate of occupancy has been issued, and no certificate shall be issued until the load rating required by this Section has been posted. (See Section 1.130.)

Section 8.230. **Wind Pressures.** For the purposes of design the wind pressure upon all vertical plans surfaces of all buildings and structures shall be taken at not less than ten (10) pounds per square foot for those portions less

than forty (40) feet above ground and at not less than twenty (20) pounds per square foot for those portions more than forty (40) feet above ground.

The wind pressure upon sprinkler tanks, sky signs, or upon similar exposed structures and their supports shall be taken at not less than thirty (30) pounds per square foot of plane surface acting in any direction. In calculating the wind pressure on circular tanks or stacks this pressure shall be assumed to act on six-tenths ($6/10$) of the projected area.

When it shall appear that a building or structure will be exposed to the full force of the wind throughout its entire height and width, the pressure upon all vertical surfaces thus exposed shall be taken at not less than twenty (20) pounds per square foot.

Section 8.301. Allowable Working Stresses. General Requirements. All members shall be so framed, anchored, tied and braced together as to develop the maximum strength and rigidity consistent with the purposes for which they may be used or to which they are likely to be subjected, and the stresses hereinafter recommended are based on the assumption that the details and connections used are fully as strong as the members connected.

Workmanship in fabrication, preparation and installation of material shall conform throughout to good engineering practice.

Section 8.302. Working Stresses in Reinforced Concrete.

1. Concrete in reinforced concrete construction, when mixed in the following proportions, stated by volume, shall be assumed to develop a laboratory cylinder compressive strength at 28 days as follows:

TABLE I.
ASSUMED STRENGTH OF CONCRETE
MIXTURE

Plastic Mass Concrete (Slump 1 to 3 inches)

Approximate mix: Volume of Portland cement to sum of separate volumes of fine and coarse aggregate.	Water-cement ratio U. S. gals. per 94-lb. sack of cement	Assumed ultimate strength at 28 days
		Lbs./in. ²
1 - 6	7¼	2,000
1 - 5	6½	2,500
1 - 4	5¾	3,000

Moderately Wet Concrete (Slump 6 to 8 inches)

1 - 6	8	1,600
1 - 5	7¼	2,000
1 - 3¼	6½	2,500
1 - 2½	5¾	3,000

Very Wet Concrete (Slump 10 inches or more)

1 - 5	8	1,600
1 - 4	7¼	2,000
1 - 3¼	6½	2,500
1 - 2½	5¾	3,000

In no case shall concrete for any assumed strength be placed with a water-cement ratio exceeding that shown. Where the aggregates are such that the mixes shown do not produce proper workability with the given water-cement ratios, the mixes shall be changed, but not the water-cement ratios.

The graded sizes of the combined aggregate shall be such that when separated on a No. 4 standard sieve the weight retaining shall not be less than one-half or more than two-thirds of the total. The fine aggregate may be crusher sand, and/or a mixture of coral sand and crusher sand.

2. If and when it is shown by evidence of tests made by competent authorities satisfactory

to the Superintendent of Buildings that concrete of a higher strength than that specified in the preceding paragraph will be used and that competent field control of mixing and placing is assured, or that concrete of less strength will be employed, the stresses shall be proportionately modified, provided that in no case shall a strength of more than 3,000 pounds per square inch be assumed.

3. The working unit stress in steel reinforcement shall not exceed 16,000 pounds per square inch, provided that this stress may be increased to 18,000 pounds per square inch when certificate of test is furnished the Superintendent of Buildings that the material conforms to the American Society for Testing Materials Standard Specifications for Billet Steel Concrete Reinforcement Bars, serial designation A 15-14, or for Rail Steel Concrete Reinforcement Bars, serial designation A 16-14. The tensile stress in cold drawn steel wire meeting the tentative specifications A 82-21T of the American Society for Testing Materials shall not exceed 18,000 pounds per square inch. Concrete shall not be assumed to resist direct tensional stress.

4. Except as otherwise specifically provided in this Code, the assumed formulas and specifications of the latest report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete shall not be exceeded in calculating the strength of slabs, beams, columns, and other elements of reinforced concrete structures, and designs shall conform thereto, which is as follows:

DIRECT STRESS IN CONCRETE:

Direct Compression

- (a) Columns whose length does not exceed 40 R
 - (1) With spirals, varies with amount of longitudinal reinforcement.

- (b) Piers and pedestals.....0.25f'c
- Compression in Extreme Fiber**
- (a) Extreme fiber stress in flexure.....0.40f'c
- (b) Extreme fiber stress in adjacent to supports of continuous beams.....0.45f'c

SHEARING STRESS IN CONCRETE.

Longitudinal Bars Without Special Anchorage

- (a) Beams without web reinforcement....0.02f'c
- (b) Beams with stirrups or kept-up bars, or combination of the two.....0.06f'c

Longitudinal Bars Having Special Anchorage

- (a) Beams without web reinforcement....0.03f'c
- (b) Beams with stirrups or kept-up bars, or combination of the two.....0.12f'c

Flat Slabs

- (a) Shear at distance from Capital or dropped panel0.03f'c

Footings

- (a) Longitudinal bars without special anchorage0.02f'c
- (b) Longitudinal bars having special anchorage0.03f'c

Bond Between Concrete and Reinforcement

- (a) Beams and slabs, plain bars.....0.04f'c
- (b) Beams and slabs, deformed bars.....0.05f'c
- (c) Footings, plain bars, one way.....0.04f'c
- (d) Footings, deformed bars, one way.....0.05f'c
- (e) Footings, bars two ways, (c) or (d) reduced by 25%.

In the foregoing, f'c is the ultimate compressive strength of concrete at twenty-eight (28) days based on the Standard Laboratory tests as specified by the American Society for Testing Materials.

Section 8.303. Cast Iron.

1. Compressive stresses in hollow cast iron

shall not exceed values determined by the formula

$$\frac{P}{A} \text{ equals } 9,000 - \frac{40L}{r}$$

in which

$\frac{P}{A}$ equals compression in pounds per sq. in.,

L equals length of the column in inches, and

r equals minimum radius of gyration of the column.

2. The maximum allowable ratio of L to r shall not exceed 90, except that when allowable working stresses computed by the above formula are reduced one-third (1/3) the ratio of L to r may be increased but shall not exceed 120.

3. Cast iron columns shall not be used in any case where the load is so eccentric as to cause tension in the cast iron, nor shall they be used for parts of the structural frame of building which are required to resist stress due to wind. Tensile stresses in the extreme fiber cast iron lintels or elsewhere, except in columns, shall not exceed 3,000 pounds per square inch.

4. The material and workmanship of cast iron columns shall be equal in all respects to that described in the American Society for Testing Materials Standard Specifications for Cast Iron Pipe and Special Castings, serial designation A 44-04. All columns resting on or supporting other columns shall have their ends machine faced to a plane surface perpendicular to the axis.

Section 8.304. Working Stresses in Structural Steel Shapes.

1. For steel acceptable to the Superintendent of Buildings, but of which the origin and physical characteristics are not definitely determined, the maximum working stresses shall not exceed those given in column (a) of the following table:

TABLE II. MAXIMUM WORKING STRESSES IN STRUCTURAL STEEL.

	(a) Acceptable Steel	(b) Standard Steel
	Lbs./in. ²	Lbs./in. ²
Direct axial tension on net section.....	16,000	18,000
Direct axial compression, maximum for short columns	12,500	14,000
Compression in columns.....	16,000—60— r	L 18,000—70— r
Fiber stress in flexure, in tension or in compression when the un- supported length (1) is not more than 15 times the breadth (b)	16,000	18,000
Compressive fiber stress in flexures for values — between 15 and 40..	L 19,600—240— s	L 22,000—270— s
Fiber stress in pins.....	24,000	27,000
Bearing on plane faced or rolled surfaces.....	24,000	27,000
Shear in gross section of webs of girders and rolled shapes in which (d) the unsupported depth between flanges or the distance be- tween stiffeners, if less, divided by (t) (the thickness of web) does not exceed 43.....	10,700	12,000

$\frac{d}{t}$	$\frac{d}{t}$	$\frac{d}{t}$
Shear when — exceeds 43.....	13,300—62—	15,000—70—
Shear in power-driven rivets or in pins.....	12,000	13,500
Shear in hand-driven rivets or in rough bolts.....	9,000	10,000
Bearing upon power-driven rivets or in pins subjected to single shear on one side of bearing in question.....	24,000	24,000
Bearing upon power-driven rivets or in pins when the bearing metal lies between the planes of shear of opposite character immediately adjacent	30,000	30,000
Bearing upon hand-driven rivets or on rough bolts subjected to single shear on one side of the bearing in question	16,000	16,000
Bearing upon hand-driven rivets or on rough bolts when the bear- ing metal lies between two planes of shear of opposite character immediately adjacent	20,000	20,000

Compression stresses in columns, computed by the formulas for column design, may not exceed in any case the maximum for direct axial compression in short columns. L equals length of column; r equals least radius of gyration.

3. For main compression members, the ratio— $\frac{L}{r}$ shall not exceed one hundred and twenty (120) and for bracing, struts and similar members two hundred (200). Compression flanges of beams and girders shall not exceed in length between lateral supports forty (40) times their width. By the term "lateral supports" is meant points where definite resistance to lateral deflection is provided of sufficient strength to prevent buckling.

Combined stress due to flexure and axial stress shall not exceed that allowed for flexure. The axial stress alone, if compression, shall not exceed that allowed in columns. (See tables.)

4. For stresses either direct or flexural produced by wind loads, or by a combination of wind loads and dead and live loads, the working stresses allowed in paragraphs (1) and (2) may be increased by twenty-five (25) per cent, provided the resulting sections are not less than those required for the dead and live loads alone.

Section 8.305. Working Stresses in Wood Members.

1. All wooden structural members shall be of sufficient size to carry the load safely without exceeding the allowable working stress of the material specified in the following table. The strength of such members shall be determined from actual dimensions of the pieces and not from nominal dimensions.

2. The stress due to dead and live loads acting singly or in combination, without wind load, shall not exceed the allowable stress specified in the following table. For stresses produced by wind loads or by a combination of wind loads and dead and live loads the working stresses allowed below may be increased by fifty (50) per cent, provided the resulting sections are not less than those required for dead and live loads alone.

3. Stress in compression perpendicular to the grain may be increased by fifty (50) per cent above that specified in the following table in the case of joists supported on a ribbon board and spiked to the studding rather than resting upon or in masonry.

4. The restrictions and limitations of the two preceding paragraphs apply to all timber structures in which the lumber is in a dry location and not exposed to the weather. Timbers exposed to the weather shall be designed on a basis of working stresses twenty-five (25) per cent lower than those recommended in the following table:

WORKING STRESSES FOR TIMBER

Allowable Stress.

	Bending in extreme fiber. Select grade	Horizontal shea. Select grade....	Compression perpen- dicular to grain. All grades.....	Compression paral- lel to grain; short columns. Select grade	Average for Modu- lus of Elasticity. All grades.....
	Lbs./in. ²	Lbs./in. ²	Lbs./in. ²	Lbs./in. ²	Lbs./in. ²
1. Douglas fir (Western Washington and Ore- gon)	1,600	90	345	1,175	1,600,000
2. Douglas fir (Western Washington and Ore- gon) dense	1,750	105	380	1,290	1,600,000
3. Oak, commercial red and white.....	1,400	125	500	1,000	1,500,000
4. Pine, white, sugar western white, western yellow	900	85	250	750	1,000,000
5. Redwood	1,200	70	250	1,000	1,200,000

SAFE STRESSES FOR SQUARE AND RECTANGULAR WOODEN COLUMNS.

Species	Grade	Ratio of Length to Least Dimension																						
		11 or less		14		17		20		23		26		29		32		35		40		50		
		Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	Lbs/ inch ²	
Douglas Fir Coast type	Select.....	1,285	1,222	1,147	1,023	831	649	521	428	358	274	175												
	Merch.....	1,060	1,025	985	913	803																		
Douglas Fir Coast type	Select.....	1,175	1,127	1,070	975	826	649	521	428	358	274	175												
	Merch.....	886	861	837	796	734	640																	
Oak—Red and White	Select.....	1,000	967	927	860	755	608	489	401	336	257	164												
	Common..	800	783	762	728	674	595																	
Pine— White	Select.....	750	718	680	617	518	405	326	268	224	171	110												
	Common..	600	583	564	532	481																		
Pine— Southern	Select.....	1,175	1,127	1,070	975	826	649	521	428	358	274	175												
	Merch.....	880	861	837	796	734	640																	

NOTE: See Section 9.703 for Column formula.

5. Working stresses in compression parallel to grain for columns shall not exceed those in the table for the respective species and ratio of unsupported length to least dimension. The ratio of unsupported length of columns to least dimension shall not exceed fifty (50).

Section 8.310. **Factor of Safety.** Whenever any device, material or construction is proposed which is not covered by the minimum working stresses in this Code, the Superintendent of Buildings shall, after determination of the strength of the same, fix the factor of safety which shall be applicable thereto. Such factor shall be consistent with factors for similar materials or uses as stipulated in this Code.

Section 8.400. **Bearing Value of Soils.** The safe bearing value of different soils shall be as determined by the Superintendent of Buildings, but in the absence of Tests shall not exceed the following values:

Soft soil	1 ton per sq. ft.
Firm clay, fine sand, or coarse compacted black sand	3 tons per sq. ft.
Gravel and black sand.....	4 tons per sq. ft.
Solid coral (depending on char- acteristics or test).....	4 tons per sq. ft.
Solid coral (depending on char- acteristics or test).....	8-15 tons per sq. ft.
Solid rock.....	15-70 tons per sq. ft.

CHAPTER 9

CONSTRUCTION

Section 9.100. **Workmanship.** Throughout this Code the values established for the strengths of structures, methods or materials, presumes good workmanship throughout, and no such structure, method or material shall be deemed to have complied with this Code unless the standards

common to the art or science of construction which are commonly applied by competent men and recognized by the building industry as good workmanship shall obtain throughout.

Section 9.200. **Excavations.** Excavations for foundations shall be of such depth and character as to insure the bearing values prescribed by this Code. (See Section 10.400 for Lateral Support.)

Section 9.310. **Footings.** Footings shall be so proportioned that the load is evenly distributed thereon and without unresisted eccentricities.

Section 9.320. **Wood Pile Foundation.** In the absence of actual test, wood piles shall conform to the following:

Minimum distance, center to center—2 feet.

Maximum unit load, at the butt—500 lbs./sq. inch.

Maximum total load—20 tons.

Any pile 20' or more in length shall be not less than 12" at the butt, for the proceeding load allowances.

The safe sustaining power of a pile not driven to refusal shall be, in the absence of test, computed by the following formula:

$$L = \frac{2WH}{P+I} \quad \text{For drop hammers.}$$

$$L = \frac{2WH}{P+I} \quad \text{For steam hammers.}$$

L=allowable load in tons (maximum 20 tons).

W=the weight of the hammer in tons.

H=the fall of the hammer in feet (maximum 15 feet).

P=the average penetration in inches for the last 5 blows.

Section 9.322. **Concrete Piles.** In the absence of actual test, the following shall be deemed a guide for acceptable design:

Concrete, 2,000 pounds crushing strength at 28 days.

Not more than one (1) splice to a pile.

When driven to refusal, maximum unit load = 500#/sq. inch on the concrete.

Clear space between heads of piles, 16 inches.

Reinforcement shall be not less than two (2) per cent longitudinal with hooping not less than $\frac{3}{8}$ inch round spaced not more than six (6) inches on centers.

The average diameter of the pile not less than twelve (12) inches, and minimum diameter six (6) inches.

The length shall not exceed 60 diameters in fairly firm material, and shall be considered as a column in very soft material overlying firm coral or rock.

The requirements for proper curing, casting and mixing of concrete stipulated elsewhere in this Code shall be complied with.

The strength of concrete piles upon driving shall be computed by the same formulae as stipulated in the preceding section for wood piles, but shall not exceed thirty (30) tons total load.

Section 9.330. Retaining Walls. For walls designed to retain embankments, or other uses, the stability shall be determined by either the Rankine, Coulomb or Cain formulae, but in no case shall the base of plain masonry walls, without surcharge loads, be less than one-fourth ($\frac{1}{4}$) the height.

Section 9.340. Areaways and Sidewalk Openings. There shall be no permanent opening of any sidewalk, except it be covered with metal sidewalk trap doors, the outer edge of which door shall not be closer than two (2) feet of the outside edge of the sidewalk curb. All such openings in sidewalks shall have metal covers

flush with the walk, with upper surface roughened. Every such door shall be provided with metal guards for the protection of the public when open. All parts of sidewalks, including illuminating tile or other structural parts, shall be capable of sustaining the loads hereinbefore stipulated for the sidewalks. (See Section 8.221.)

Section 9.410. Solid Brick Walls. Quality of Materials. Brick and sand-lime brick used for bearing walls or piers shall be of quality at least equal to the "medium brick" described by the Standard Specifications for Building Brick of the American Society for Testing Materials, except that when the average compressive strength of brick grading "soft" by the absorption test is more than 2,500 pounds per square inch, the requirements as to absorption may be waived. When used for non-bearing purposes and not exposed to the weather, brick may be of quality not inferior in any respect to the "soft" brick described in the above specifications.

The average compressive strength of concrete brick 28 days after being manufactured, or when delivered on the job, shall be not less than 1,500 pounds per square inch of gross cross-sectional area tested in the position as laid in the wall, and the compressive strength of any individual brick thus tested shall be not less than 1,000 pounds per square inch.

All cements and limes used in mortar shall conform to the requirements of the standard specifications for these materials issued by the American Society for Testing Materials.

Sand used in mortar shall be clean crusher or beach sand and free from animal or vegetable matter.

Section 9.411. Lateral Support. Solid brick walls shall be supported at right angles to the

wall face at intervals not exceeding eighteen (18) times the wall thickness in the top story or twenty (20) times the wall thickness elsewhere. Such lateral support may be obtained by cross walls, piers or buttresses, when the limiting distance is measured horizontally, or by floors when the limiting distance is measured vertically. Sufficient bonding or anchorage shall be provided between the wall and the supports to resist the assumed wind force, acting in an outward direction. Piers or buttresses relied upon for lateral support shall have sufficient strength and stability to transfer the wind force, acting in either direction to the ground. When walls are dependent upon floors for their lateral support, provisions shall be made in the building to transfer the lateral forces resisted by all floors to the ground.

Section 9.412. **Working Stresses.** The maximum allowable compressive stresses in brick masonry due to combined live and dead loads shall not exceed the following limits:

Brick Masonry Stresses

	Maximum unit working stresses (pounds per square inch)		
	Portland cement mortar	Natural cement or cement- lime mortar	Lime mortar
Brick (clay), medium grade....	170	130	90
Sand-lime brick	170	130	90
Concrete brick	170	130	70

Where the effects of eccentric loading and lateral forces are fully analyzed and allowance made for them in the design, or under local con-

centrated loads applied to a limited proportion of the total area of the wall, the working stresses in this table may be increased by fifty (50) per cent.

Section 9.413. Thickness of Exterior Walls Other than in Skeleton Construction. The thickness of solid brick bearing walls shall be sufficient at all points to keep the combined stresses due to live and dead loads for which the building is designed within the limits prescribed by Section 9.412.

The minimum thickness for solid brick exterior bearing or party walls shall be 12 inches for the uppermost thirty-five (35) feet of their height, and shall be increased four (4) inches for each successive fifteen (15) feet or fraction thereof measured downward from the top of the wall; except that the top story exterior bearing wall of a building not exceeding three (3) stories or forty (40) feet in height, or the wall of a one-story commercial or industrial building may be eight (8) inches thick, provided that such 8-inch wall does not exceed twelve (12) feet unsupported height and that the roof beams are horizontal; and except that exterior solid brick bearing walls of one and two-family dwellings may be eight (8) inches thick when not more than thirty (30) feet in height. When gable construction is used for such dwellings, an additional five (5) feet is permitted to the peak of the gable.

Where solid brick exterior bearing or party walls are stiffened at distances not greater than twelve (12) feet apart by cross walls, or by internal or external offsets or returns, at least two (2) feet deep, they may be twelve (12) inches thick for the uppermost seventy (70) feet, measured downward from the top of the wall, and shall be increased four (4) inches thickness for

each successive seventy (70) feet or fraction thereof.

The minimum thickness of solid brick exterior nonbearing walls shall be twelve (12) inches for the uppermost seventy (70) feet of their height, and shall be increased four (4) inches for each successive thirty-five (35) feet or fraction thereof, measured downward from the top of the wall, except that the top story wall of a building not exceeding three (3) stories or forty (40) feet in height, or the wall of a one-story commercial or industrial building may be eight (8) inches thick, provided that such 8-inch wall does not exceed twelve (12) feet unsupported height, and that the roof beams are horizontal; and except that solid brick nonbearing walls of one and two-family dwellings may be eight (8) inches in thickness when not more than thirty (30) feet in height. When gable construction is used for such dwellings an additional five (5) feet is permitted to the peak of the gable.

Section 9.414. Bond. In all brick walls at least every sixth course on both sides of the wall shall be a header course or there shall be at least one full length header in every seventy-two (72) square inches of each wall surface. In walls more than twelve (12) inches thick the inner joints of header courses shall be covered with another header course which shall break joints with the course below.

Where running bond is used, every sixth course on each face shall be bonded into the backing by cutting the face brick course and using diagonal headers behind it or by using a split brick.

Section 9.415. Piers. The unsupported height of brick piers shall not exceed ten (10) times their least dimension.

Section 9.416. Chases and Recesses. There shall be no chases in 8-inch walls or within the required area of any pier, and no chase in any wall or pier shall be deeper than one-third ($1/3$) the wall thickness. No horizontal chase shall exceed five (5) feet in length, nor shall the horizontal projection of any diagonal chase exceed four (4) feet.

Recesses for stairways or elevators may be left in walls, but in no case shall the walls at such points be less than the required thickness of walls of the fourth story above the ground floor unless reinforced by additional piers, by steel or reinforced concrete girders, or steel or reinforced concrete columns and girders, securely anchored to the walls on each side of such recesses. Recesses for alcoves and similar purposes shall have not less than eight (8) inches of material at the back. Such recesses shall be not more than eight (8) feet in width and shall be arched over or spanned with lintels.

The aggregate area of recesses and chases in any wall shall not exceed one-fourth the whole area of the face of the wall in any story.

No chases or recesses shall be permitted in fire or fire division walls that will reduce the thickness below the minimum specified in this Code. (Sections 9.470 to 9.473.)

Openings for doors and windows shall have well-buttresses, arches or lintels of masonry, or of metal with bearing at each end of not less than four (4) inches on the wall.

Section 9.420. Hollow Tile Walls.

(1) **Hollow Clay Tile** used for exterior bearing walls or piers or for party walls shall be of quality at least equal to the "medium class" as prescribed by the Tentative Specifications for Hollow Burned-Clay Lead-Bearing Wall Tile of the American Society for Testing Materials.

When used for non-bearing purposes and not exposed to the weather, hollow tile may be of quality not inferior in any respect to the "soft class" described in the above specifications.

(2) **Concrete Block or Concrete Tiles.** The strength requirements for compression 28 days after manufacture of concrete block and concrete tile shall be classified as Load Bearing and Non-Load Bearing and shall have the following breaking strength:

Name of Classification	Compressive strength, lb. per sq. in. of gross cross-sectional area as laid in the wall.	
	Average of 3 or more units	Minimum for individual unit
Load bearing block or tile.....	700	600
Non-load bearing block or tile..	250	200

Tests on concrete block shall be conducted in accordance with the Standard Specifications of the American Concrete Institute.

(3) **Brick.** Brick for hollow walls shall conform to requirements of Section 9.410.

(4) **Mortar.** Either Portland cement mortar as defined in Chapter 2 or cement-lime mortar shall be used for walls of hollow unit construction or hollow walls of brick.

Section 9.421. **Lateral Support for Hollow Tile.** Walls of hollow tile or of concrete block or tile, and all hollow walls of brick shall be supported at right angles to the wall face at intervals not exceeding sixteen (16) times the wall thickness in top stories, or eighteen (18) times the wall thickness elsewhere. Such lateral support may be in the form of cross walls, piers, or buttresses when the limiting distance is horizontal, or by floors when the limiting distance is vertical. Sufficient bonding or anchorage shall be pro-

vided between the wall and the supports to resist the assumed wind force acting in an outward direction. Piers or buttresses relied upon for lateral support shall have sufficient strength and stability to transmit the wind force, acting in either direction, to the ground. When walls are dependent on floors for their lateral support, provision shall be made in the building to transfer the lateral force resisted by all floors to the ground.

Section 9.422. Working Stresses for Hollow Tile. The maximum allowable compressive stresses in masonry of hollow tile, concrete block or concrete tile, or hollow walls of brick, due to combined live and dead loads, shall not exceed eighty (80) pounds per square inch of gross sectional area, when laid with Portland cement mortar, and seventy (70) pounds per square inch of gross sectional area when laid with cement-lime mortar. (See Chapter 2 for definition of Cement-Lime Mortar.)

Section 9.423. Thickness of Hollow Tile Exterior Walls. Other Than Skeleton Construction. Walls of hollow tile, concrete block or tile, or hollow walls of brick shall not exceed fifty (50) feet in height above the top of foundation walls.

The thickness of walls of the above materials and types shall be sufficient at all points to keep the stresses due to combined live and dead loads for which the building is designed within the limits prescribed by Section 9.422.

The minimum thickness of exterior walls of hollow tile, or concrete block or tile, or of hollow-wall construction shall be twelve (12) inches for the uppermost thirty-five (35) feet of their height, and at least sixteen (16) inches for the remaining lower portion; except that the top story wall of a building not exceeding three

(3) stories or forty (40) feet in height, or the wall of a one-story commercial or industrial building, may be eight (8) inches thick, provided that the roof beams are horizontal and that a concrete beam, reinforced with three-fourths ($\frac{3}{4}$) per cent of steel, be placed continuously around the top of such walls at the line of the roof-supporting members; and except that exterior walls of one and two-family dwellings may be eight (8) inches thick for the uppermost twenty (20) feet. When gable construction is used for such dwellings an additional five (5) feet is permitted to the peak of the gable.

Where walls are stiffened at distances not greater than twelve (12) feet, by cross walls or by internal or external returns at least two (2) feet deep, the thickness may be twelve (12) inches throughout, except that the top story, or for one and two-family dwellings the uppermost twenty (20) feet, may be eight (8) inches as previously provided. (For interior wall requirements see Sections 9.470 to 9.473, and 9.475 and 9.476.)

Section 9.424. Bond for Hollow Tile Walls.

Where two or more hollow units are used to make up the thickness of a wall, the inner and outer courses shall be bonded at vertical intervals not exceeding three (3) courses by lapping at least one (1) cell completely over a cell of the unit below.

Section 9.425. Beam Supports for Hollow Tile Walls. Suitable provision shall be made at each line of floor beams in hollow walls or walls of hollow units to shut off the spaces above from those below, and to ensure good bearing for beams and uniform distribution of loads.

Section 9.426. Piers for Hollow Tile Walls. Hollow tile or hollow concrete block or tile shall

not be used for isolated piers unless solidly filled with concrete. The unsupported height of such piers shall not exceed ten (10) times their least horizontal dimension.

Section 9.427. Chases and Recesses for Hollow Tile Walls. Chases and recesses in walls of hollow tile, hollow concrete block or tile, or in hollow walls of brick shall not exceed in extent those permitted for solid brick walls under the same conditions. Chases and recesses shall not be cut in walls of the above types, but may be built in. No chases or recesses shall be permitted in fire walls that will reduce the thickness below the minimum specified in this Code.

Openings for doors and windows shall have wall-buttressed arches or lintels of masonry or metal with bearing at each end of not less than four (4) inches on the wall. On the inside of openings less than five (5) feet wide, in which the thickness of arches and lintels is less than that of the wall supported, timber may be used, which will rest at each end not more than two (2) inches on the wall and be chamfered or cut to serve as arch centers.

Section 9.430. Concrete Walls, Materials. Monolithic concrete construction containing not more than two-tenths (2/10) of one (1) per cent of reinforcement shall be classed as plain concrete.

Materials for bearing walls and piers of plain concrete shall be mixed in proportions of one (1) part of Portland cement to not more than three (3) parts of sand and five (5) parts of coarse aggregate, by volume, or a mixture of fine and coarse aggregate giving an equivalent strength and density.

Coarse aggregate shall consist of crushed stone or gravel, eighty-five (85) per cent of which is retained on a No. 4 screen, and shall be graded

in size from small to large particles. The particles shall be clean, hard, durable, and free from deleterious material.

Cement for plain concrete shall conform to the requirements of the Standard Specifications and Tests for Portland Cement of the American Society for Testing Materials.

Fine aggregate shall consist of sand, stone screenings or other similar inert materials, or a combination thereof, having clean, hard, strong, durable uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, organic matter, loam or other deleterious substances; and shall range from fine to coarse. Not less than ninety-five (95) per cent shall pass a No. 4 sieve, and not more than thirty (30) per cent shall pass a No. 5 sieve, when tested according to the standard practice prescribed by the American Society for Testing Materials.

Section 9.431. Lateral Support, Concrete Walls.

Plain concrete walls shall be supported at right angles to the wall face at intervals of not exceeding twenty (20) times the wall thickness. Such lateral support may be in the form of cross walls, piers, or buttresses when the limiting spacing is horizontal, or by floors when the limiting distance is vertical. Sufficient bonding or anchorage shall be provided between the wall and the supports to resist the assumed wind force acting in an outward direction. Piers or buttresses, relied upon for lateral support, shall have sufficient strength and stability to transfer the wind force, acting in either direction, to the ground. When walls are dependent upon floors for their lateral support, provision shall be made in the building to transfer the lateral force resisted by all floors to the ground.

Section 9.432. Working Stresses. Concrete

Walls. The maximum allowable stresses in masonry of plain concrete of the proportions specified in Section 9.430 as a minimum due to combined dead and live loads shall not exceed four hundred (400) pounds per square inch in compression, thirty-five (35) pounds per square inch in tension or diagonal tension; or ninety (90) pounds per square inch in punching shear. When plain concrete of greater strength is used the foregoing stresses may be increased twenty (20) per cent of the ultimate compressive strength for concrete in compression, two (2) per cent in tension or diagonal tension, and four and one-half ($4\frac{1}{2}$) per cent in punching shear.

Section 9.433. Thickness of Concrete Walls. The minimum thickness of plain concrete bearing walls shall be ten (10) inches for the uppermost thirty-five (35) feet of their height and shall be increased four (4) inches for each successive thirty-five (35) feet or fraction thereof, measured downward from the top of the wall; except that the top story wall of a building not exceeding three (3) stories or forty (40) feet in height, or the wall of a one-story building may be eight (8) inches thick, provided that such 8-inch wall does not exceed fourteen (14) feet unsupported height and that the roof beams are horizontal, and except that exterior bearing walls of one and two-family dwellings may be six (6) inches thick when not more than thirty (30) feet in height. When gable construction is used for such dwellings an additional five (5) feet is permitted to the peak of the gable.

When plain concrete bearing walls of buildings more than three (3) stories high are stiffened at points not more than twelve (12) feet apart by cross walls, or by internal or external offsets or returns at least two (2) feet deep, they

may be ten (10) inches thick for the uppermost seventy (70) feet of their height and shall be increased four (4) inches in thickness for each successive seventy (70) feet or fraction thereof.

The minimum thickness of plain concrete exterior non-bearing walls shall be ten (10) inches for the uppermost seventy (70) feet of their height, and shall be increased four (4) inches for each successive thirty-five (35) feet or fraction thereof, measured downward from the top of the wall; except that the top story wall of a building not exceeding three stories or forty (40) feet in height, or the wall of a one-story commercial or industrial building may be eight (8) inches thick, provided that such 8-inch wall does not exceed fourteen (14) feet unsupported height, and that the roof beams are horizontal; and except that exterior non-bearing walls of one and two-family dwellings may be six (6) inches thick when not more than thirty (30) feet in height. When gable construction is used for such dwellings an additional five (5) feet is permitted to the peak of the gable.

Hollow monolithic walls of plain concrete shall have the same net cross sectional area of material, irrespective of the space within the wall, as required for solid walls. The inner and outer parts of such walls shall be securely braced and tied together with non-corrodible ties or other means to bring them into common action. Where floor and roof systems are carried by such walls, provision shall be made for the distribution of these loads to the full cross section of the wall. (For interior wall requirements, see Sections 9.470 to 9.473, also 9.475 and 9.476.)

Section 9.434. Reinforcement. Concrete Walls. Reinforcement, not less than two-tenths (2/10) of one (1) per cent computed on a vertical height of twelve (12) inches, shall be placed over

all wall openings and at corners of the structure to prevent cracks. Floor and roof connection details shall be designed to transmit safely the vertical and horizontal loads imposed.

Section 9.435. Piers. Concrete Walls. The unsupported height of isolated piers of plain concrete shall not exceed ten (10) times their least dimension. (See definition Chapter 2, "Piers".)

Section 9.436. Chases and Recesses. Concrete Walls. Chases and recesses in plain concrete walls shall not exceed in extent those permitted for solid brick walls under the same conditions. (See Section 9.416.)

Section 9.440. Working Stresses. Stone Walls. The maximum allowable compressive stresses in rubble stonework of sound and dense lava rock due to combined live and dead loads shall not exceed 140 pounds per square inch when laid in Portland cement mortar, 100 pounds per square inch in natural cement or cement-lime mortar, and seventy (70) pounds per square inch in lime mortar.

The maximum allowable compressive stress in ashlar masonry due to combined live and dead loads shall not exceed the following limits:

Unit	Maximum unit working stresses (pounds per square inch) laid in		
	Portland cement mortar	Cement lime or natural cement mortar	Lime mortar
Granite	800	640	400
Limestone	500	400	250
Marble	500	400	250
Sandstone	400	320	160
Blue Lava Rock.....	500	400	250

Section 9.441. Lateral Support. Stone Walls. Rubble stone walls shall be four (4) inches thicker than is required for solid brick walls of the same respective heights, but in no part less than fourteen (14) inches.

The minimum thickness for walls or piers of ashlar masonry properly bonded shall be the same as required for solid brick walls and piers under similar conditions.

The lateral support for stone walls shall conform to the same requirements specified for solid brick walls, Section 9.411.

Section 9.442. Bond for Stone Walls. Bond stones extending through the wall and uniformly distributed shall be provided to the extent of not less than ten (10) per cent of the area, and there shall be at least one (1) bond stone for every eight (8) stretchers.

Section 9.443. Chases and Recesses. Stone Walls. Chases and recesses in stone walls shall not exceed in extent those permitted for solid brick walls under the same conditions. (See Section 9.416.)

Section 9.450. Quality of Materials. Veneered Walls. Materials used in the backing and veneering of veneered walls shall conform in all respects to the requirements prescribed for such materials in Sections 9.410, 9.420 and 9.430. Stone or architectural terra-cotta ashlar, or other approved masonry material used for veneering, shall be not less than three (3) inches thick. In stone ashlar each stone shall have a reasonably uniform thickness, but all stones need not necessarily be the same thickness.

Section 9.451. Working Stresses. Veneered Walls. The maximum allowable compressive stresses on the backing of veneered walls, due to combined live and dead loads, shall not exceed those elsewhere prescribed for masonry of the

type which forms such backing. In no case shall the veneering be considered a part of the wall in computing the strength of bearing walls, nor shall it be considered a part of the required thickness of the wall.

Section 9.452. Attachment of Veneering. When walls are veneered with brick, terra cotta, stone or concrete trimstone the veneering shall be tied into the backing either by a header for every 300 square inches of wall surface, or by substantial non-corrodible metal wall ties spaced not farther apart than one (1) foot vertically and two (2) feet horizontally. Headers shall project at least $3\frac{3}{4}$ inches into the backing, and anchors shall be of substantial pattern. When veneering is used special care shall be taken to fill all joints flush with mortar around wall openings.

Section 9.453. Height of Veneered Walls. Veneer on walls shall not exceed fifty (50) feet in height above foundations.

Section 9.460. Quality of Materials. Faced Walls. Materials used in the backing and facing of faced walls shall conform in all respects to the requirements prescribed for such materials in Sections 9.410, 9.420 and 9.430. Materials used for facing shall be not less than $3\frac{3}{4}$ inches thick, and in no case less in thickness than one-eighth ($\frac{1}{8}$) the height of the unit, excepting that spandrel and other recessed panels, when approved, may be higher than eight (8) times their thickness, provided they are of the maximum thickness required; provided, however, that marble or terra cotta of any thickness may be used for the first story walls only when such is well secured by non-corroding ties to the walls.

Section 9.461. Working Stresses. Faced Walls. The maximum allowable compressive stresses on

faced walls due to combined live and dead loads shall not exceed those elsewhere prescribed for masonry of the type which forms the backing. Where bonded to the backing as provided in Section 9.463, the full cross section of the facing may be considered in computing bearing strength.

Section 9.462. Thickness. Faced Walls. Faced walls shall be not less in thickness than is required for masonry walls of the type which forms the backing. Where bonded to the backing as provided in Section 9.463, the facing may be considered a part of the wall thickness.

Section 9.463. Bond for Faced Walls. Brick facing shall be bonded to walls of brick or of hollow tile, or of concrete block or tile with at least one (1) header course in every six (6) courses, or there shall be at least one (1) full length header in every seventy-two (72) square inches of wall surface.

Stone ashlar facing shall have at least twenty (20) per cent of the superficial area not less than $3\frac{3}{4}$ inches thicker than the remainder of the facing to form bond stones, which shall be uniformly distributed throughout the wall.

When some stones in every alternate course are at least $7\frac{1}{2}$ inches thick, bonded into the backing at least $3\frac{3}{4}$ inches, and at least twenty (20) per cent of the superficial area of the wall is constituted of such bond stone uniformly distributed, the ashlar facing may be counted as part of the wall thickness. Every stone not a bond stone and every projecting stone shall be securely anchored to the backing with substantial non-corrodible metal anchors.

Section 9.470. Brick and Plain Concrete Fire Walls. Solid brick or plain concrete fire walls shall not be less in thickness than required for exterior bearing walls of corresponding height.

but not less than twelve (12) inches, except that solid brick fire walls for buildings of residential occupancy shall be not less than eight (8) inches thick for the uppermost twenty (20) feet of height and shall be at least twelve (12) inches thick for the remaining lower portion; and except that plain concrete fire walls for such structures may be eight (8) inches throughout. No 8-inch fire wall shall be broken into, subsequent to building, for the insertion of structural members. (For definitions of Fire Walls, see Chapter 2.)

Party walls which function also as fire walls shall conform to requirements for fire walls.

A separation of at least six (6) inches of solid masonry shall be provided in all fire and party walls between combustible members which may enter such walls from opposite sides.

Section 9.471. Fire Walls of Hollow Tile, Concrete Block or Concrete Tile, or of Hollow Wall Construction. Fire walls of hollow tile or concrete block or concrete tile shall be not less than sixteen (16) inches thick in any part, except that for residential buildings they may be not less than twelve (12) inches thick throughout. Hollow walls of brick used as fire walls shall be not less than twelve (12) inches thick throughout. No fire walls of the above type shall be broken into, subsequent to erection, for the insertion of structural members.

Where combustible or unprotected steel building members frame into hollow party or fire walls of thickness not greater than twelve (12) inches, they shall not project more than four (4) inches into the wall and shall be so spaced that the distance between embedded ends is not less than four (4) inches. The space above, below and between them shall be filled solidly with burnt-clay materials, mortar, concrete or equiv-

alent fire-resistive material, to a depth of not less than four (4) inches on all sides of the members.

All open cells in tile or blocks occurring at wall ends shall be filled solidly with concrete for at least a depth of six (6) inches, or closure tile set in the opposite direction shall be used.

Party walls which function also as fire walls shall conform to requirements for fire walls.

Section 9.472. Fire Division Walls. Fire division walls of solid brick or plain concrete shall be not less than eight (8) inches thick.

Fire division walls of hollow tile, or of concrete block or tile, shall be not less than twelve (12) inches thick in any part, and for buildings of storage and heavy manufacturing occupancy they shall be not less than sixteen (16) inches thick throughout. Hollow walls of brick used as fire division walls shall be not less than twelve (12) inches thick throughout.

Section 9.473. Alternate Requirements for Fire and Fire Division Walls. Wall construction that in fire tests conducted according to accepted standards develop safe fire-resistance periods of one and one-half (1½) hours may be permitted for fire walls, and fire division walls between residence occupancies, if otherwise adequate in point of strength and stability. For general mercantile and manufacturing occupancies, excluding buildings or portions of buildings used for storage, wall construction developing, on the same basis, a safe fire-resistance period of three (3) hours shall be similarly permitted.

Section 9.474. Parapet Walls. In all first and second class buildings and "slow burning heavy timber construction" buildings, except as hereafter provided, all exterior walls on all mercantile and commercial buildings shall continue not less than three (3) feet above the roof and for

other buildings two (2) feet above the roof, forming a parapet wall which shall be coped, which shall be of the same thickness as the top story thickness, or eight (8) inches of masonry or six (6) inches of reinforced concrete if the parapet is three (3) feet or under in height, and in the case of masonry shall be laid in cement or cement-lime mortar. Provided, however, that first class buildings may have eaves of reinforced concrete in lieu of parapets. All openings in such eaves shall be cut off from the interior roof space by suitable cut-off walls at least eight (8) inches in thickness.

Provided, further, that second class buildings may have eaves instead of parapets if such are constructed as follows:

1. The eave or coping to have its center of gravity in the center of the wall.

2. An effectual fire stop shall be made at the junction with the frame roof supports.

3. The roof covering shall be rigid asbestos shingles, slate, clay tile, or other similar fire-proof covering.

4. The roof supports to be carried so that the weight of the roof shall not affect the location of the center of gravity provided in Paragraph 1.

Section 9.475. Bearing Partitions. All interior bearing walls, except fire walls, fire division walls and party walls are considered as bearing partitions.

For bearing partitions, materials meeting the ordinary accepted local standards for the purpose may be used.

Where not utilized as party, fire or fire division walls, solid brick bearing partitions shall be not less than eight (8) inches thick, and those of hollow tile, concrete block or concrete tile, or hollow walls of brick shall be not less in thickness than one-eighteenth (1/18) of the

height between floors or floor beams. (For conditions governing concentrations see Section 9.412.)

Section 9.476. Nonbearing Partitions. For nonbearing partitions, materials meeting the ordinary accepted local standards for the purpose may be used.

Brick nonbearing partitions shall be not less than 3¼ inches thick for a height not exceeding twelve (12) feet between floors or floor beams and for a length not exceeding twenty (20) feet between vertical supports. Nonbearing partitions of hollow tile, concrete block or concrete tile, plastered metal studded and metal lathed partitions, hollow walls of brick or of gypsum block or other similar materials shall be built solidly against floor and ceiling construction below and above, and shall not exceed the following unsupported heights:

Thickness inclusive of plaster	Maximum unsupported height	Thickness exclusive of plaster	Maximum unsupported height
2 inches	12 feet	6 inches	20 feet
3 inches	14 feet	8 inches	25 feet
4 inches	16 feet		

Section 9.477. Foundation Walls. Foundation walls for solid-wall construction shall be of stone, solid brick concrete (plain, rubble or reinforced), or concrete block. Solid brick foundation walls and those of concrete block or coursed stone shall be not less in thickness than the walls immediately above them and in no case less than twelve (12) inches thick, except that when the inclosure is not excavated, they may be eight (8) inches thick if included within the allowable height of 8-inch walls. When built of concrete cast in place foundation walls shall be

at least as thick as the walls supported, but in no case less than eight (8) inches. When built of rubble stone, they shall be at least sixteen (16) inches thick. Rough or random rubble without bonding or level beds shall not be used as foundations for walls exceeding thirty-five (35) feet in height, nor shall coursed bonded rubble walls be used as foundations for walls exceeding seventy-five (75) feet in height.

Foundation walls for hollow tile, concrete block or tile, hollow walls of brick, or frame construction, shall be of the same thickness, respectively, as required in the paragraph above, and shall be built of brick, stone, concrete (plain, rubble or reinforced), hollow tile, concrete block or tile, or hollow walls of brick. Tile foundation walls shall be not less than twelve (12) inches thick.

When the stresses due to earth pressure and superimposed building load exceed the maximum working stress elsewhere specified for brick masonry, and the additional stresses are not otherwise provided for, the wall thickness shall be increased to bring them within these limits.

Foundation walls for frame construction shall extend at least eight (8) inches above the adjoining ground surface.

Materials for foundation walls shall be equal in quality in all respects to those required for exterior bearing walls, except that mortar containing lime in greater proportions by volume than one (1) part to one (1) part of cement and six (6) parts of sand shall not be used for exterior foundation walls below grade.

Section 9.478. Panel and Enclosing Walls. Panel walls in buildings of skeleton construction shall be not less than eight (8) inches

thick if of solid brick, hollow tile, concrete block or tile, plain concrete, or hollow walls of brick. Inclosure walls shall be not less than eight (8) inches thick nor less in thickness than one-twentieth ($1/20$) the horizontal distance between anchors.

Section 9.480. New Types of Masonry Construction. The use of new or improved masonry materials or methods not covered by this Code may be permitted, providing that they conform to specifications insuring reasonable uniformity of the product; and that the stability and durability of such construction, and its resistance under fire exposure, shall have been satisfactorily demonstrated. Working stresses shall be fixed at not more than twenty (20) per cent of the average ultimate strength of masonry walls constructed of such materials, as determined by responsible authorities.

Section 9.481. Anchoring Walls. All walls shall be securely anchored and bonded at points where they intersect.

Section 9.482. Use of Existing Walls. An existing brick wall may be used in the renewal or extension of a building; or may be increased in height beyond that allowed of construction, provided that such wall is structurally sound or can be made so by reasonable repairs. Walls increased in height shall be at least four (4) inches thicker than is required by this Code for newly constructed walls of such increased height, and in no case shall linings be less than eight (8) inches thick and laid in Portland cement mortar. The foundations and lateral support shall be equivalent to those elsewhere required for newly constructed walls under similar conditions. All linings shall be thoroughly bonded into existing masonry by toothings of brick or stone to assure combined action of wall

and lining. Such toothings shall be distributed fairly uniformly throughout the wall and shall aggregate in vertical cross sectional area not less than fifteen (15) per cent of the total vertical area of the lining.

No existing wall shall be used for renewal or extension of a building, or increased in height without special written permission from the Superintendent of Buildings.

Section 9.483. Corbeling of Chimneys. No brick wall less than twelve (12) inches thick shall be used to support a corbeled chimney. Such corbeling shall not project more than six (6) inches from the face of the wall, and in all such cases the corbeling shall consist of at least five (5) courses of brick. No chimney shall be corbeled from a wall built of hollow tile, hollow concrete block, concrete tile, or hollow walls of brick.

Section 9.484. Cornices. The centers of gravity of stone cornices shall be inside of the outer wall face. Terra cotta or metal cornices shall be structurally supported from the roof of the building, or as provided in Section 9.474.

Section 9.500. Reinforced Concrete. Reinforced concrete will be approved for all types of buildings, when such design conforms to good engineering practice and the stresses therein conform to the units provided by this Code.

(Note: For quality and working stresses, see Sections 8.301 and 8.303.)

Section 9.502. The Cement used in reinforced concrete shall pass the test specifications of the American Society for Testing Materials for Portland Cement.

Section 9.503. Ingredients of Reinforced Concrete shall be such, and so mixed and placed, that the designed strength shall be met as stipulated in Section 8.301 to 8.303 hereof.

Section 9.504. **Design.** Reinforced concrete computations shall be based upon the following assumption:

1. A plane section before bending remains a plane section after bending.

2. The modulus of elasticity of concrete in compression remains constant within the working limits fixed by this Code.

3. The adhesion between concrete and reinforcement is perfect.

4. Concrete has no resistance to tension.

5. Initial stress in the reinforcement due to contraction or expansion of the concrete is negligible.

6. "n" or the ratio of the moduli of elasticity of steel and concrete with an ultimate crushing strength of 2,000 pounds shall be taken as fifteen (15), and "n" for 3,000 pounds concrete shall be taken as twelve (12).

Section 9.505. **The Span Length** of beams shall be taken center to center of supports, but need not be taken to exceed the clear span plus the over-all depth of beam or slab. Brackets shall not be considered as reducing the clear span in the sense here intended.

Section 9.506. **Bending Moments.** The bending moments of slabs due to uniformly distributed loads shall be taken as not less than:

$\frac{1}{8}$ WL at center when simply supported;

$\frac{1}{10}$ WL at center and continuous support when supported at one end and continuous at the other:

$\frac{1}{12}$ WL at center and intermediate supports when continuous over more than two (2) supports;

W is the total distributed dead and live loads;

L is the length of span.

Section 9.507. **Bending Moments of Slabs Supported on Four Sides.** When slabs are reinforced

in both directions, and supported on four (4) sides, the same coefficients as prescribed in the preceding section for slabs may be used in each direction. The loading, however, shall be de-

signed in accordance with the formula $r = \frac{1^4}{1^4 + b^4}$

in which l = the length and b the breadth of the slab, and r = the proportion of the load carried by the transverse reinforcement. If l exceeds $1.5 b$, the transverse reinforcement shall be considered to carry the entire load.

Section 9.508. Continuous Beams. In continuous beams, the extreme fiber stress in concrete in compression may be increased fifteen (15) per cent adjacent to the supports.

Section 9.509. Shearing Stresses. In computing the section of concrete for shear, the depth below the center of compression and the center of tension shall be used.

Section 9.510. Bending Moments for Beams and Girders. Bending moment coefficients for beams and girders shall be the same as for slabs (see Section 9.506) unless of unusual length, in which case accepted theory of design shall be used.

Section 9.511. Bending Moments of slabs, beams or girders, which are continuous over two (2) spans only, shall be taken as $\frac{1}{8}$ WL over the central support, and $\frac{1}{10}$ WL near the middle of the span.

Section 9.512. Negative Moments at Supports. Provision for bending of continuous slabs, beams and girders at supports shall be made with sufficient bend of steel therefore to insure proper development of tensile strength.

Section 9.513. Web Reinforcement in Beams. Beams and girders shall be provided with stirrups or bent-up bars or both to resist the shearing stresses when such exceed the diagonal

shearing strength of the concrete. Stirrups, if necessary, shall not be spaced greater than $\frac{3}{4}$ the depth of the beam or girder. Stirrups and bent bars shall be so fixed as to develop the necessary tensile strength of the reinforcement.

Section 9.514. T Beams. With monolithic casting of slabs and beams the slab may be deemed a portion of the beam and so computed. The overhanging slab on each side so considered shall be not more than $\frac{1}{6}$ the span or four (4) times the thickness of the slab. For the calculation of longitudinal shear and diagonal tension, the stem of the T only shall be considered. At supports, continuous T beams shall be reinforced for the negative moment, if necessary, with reinforcement of sufficient length to insure proper bond.

Section 9.515. Length of Columns. The length of columns shall be taken as the unsupported length, which shall not exceed fifteen (15) times the least diameter, nor shall the least diameter be less than twelve (12) inches. Knees and corbel braces shall be disregarded.

Section 9.516. Composite Structural Steel and Reinforced Concrete Columns. Structural steel columns which have a minimum of four (4) inches of concrete, reinforced with not less than .5 per cent each of hooping spaced not over twelve (12) inches apart, and longitudinal steel, exclusive of the structural steel column, may be computed at 16,000 pounds per square inch of structural steel section, but no allowance shall be made for the reinforced concrete casing. The hooping shall be not nearer than $1\frac{1}{2}$ inches to the outer surface, nor one (1) inch to the structural steel.

Section 9.517. Bending and Direct Stress in Columns. Bending and direct stress in columns shall be so computed that the safe working

stresses in the extreme fiber shall be not exceeded. The following formula may be used for this computation:

$$f_1 + f_2 = \frac{My}{P l^2} + \frac{P}{A} \frac{1}{1 - \frac{Pl^2}{10E}}$$

in which

f_1 = fiber stress due to bending;

f_2 = fiber stress due to direct loading;

y = distance from neutral axis to the extreme fiber on the side of maximum compression;

M = bending moment due to the eccentric load;

P = the direct compressive load;

l = the length of the member in inches;

$\frac{P}{A}$

= the unit compressive stress in pounds per square inch.

E = the modulus of elasticity of the material.

Section 9.518. Flat Slab Construction. Flat slab construction, that is, slabs supported only by columns without beams and girders, shall be designed in accordance with the coefficients of bending moments stipulated in this Code. Empirical formulas shall not be considered. Methods of analysis shall be as follows:

1. The portion of the slab adjacent to the column shall be considered as a circular plate supporting as a cantilever the central portion. The cantilever portion shall be designed for the live and dead loads over its area, plus a concentrated load at its perimeter equal to the live and dead loads of the suspended portion. The radius of the cantilever section shall be the average distance from the center of the column to the point of inflection of the slab.

2. Or the slab may be considered to consist of a series of broad flat girders from column to column in either one or two directions. Diagonal

reinforcing shall be resolved to the one or two directions considered. The width of bands shall be such as to properly cover the area, but shall not exceed 0.4 times the side of the square panel. Where steel is provided in two directions only, the central portion shall be considered as a slab supported on four (4) sides. Punching shear shall be taken at the edge of the column shaft at 120 pounds per square inch. In computing shearing stress for diagonal tension determination, a point shall be taken a distance out from the column capital equal to the effective depth of the slab. Working stresses shall conform to those stipulated in Section 8.302.

Section 9.519. Flat Slab Columns.

1. The column capital shall have a least diameter not less than $.225 L$ where L is the square root of the area between four (4) adjacent columns. The thickness of the columns capital at this diameter shall be not less than $1\frac{1}{4}$ inches. The slope of the column capital shall nowhere be less than 45° with the vertical.

2. A depressed head or drop may be cast above the capital and the dimensions of this cap shall be not less than $0.4L$ as above defined.

3. The point of inflection shall be assumed $\frac{1}{6} \sqrt{3} L$ from the center of the column.

4. In rectangular panels, the long dimension shall not exceed $\frac{4}{3}$ of the short dimension.

5. Columns shall be capable of carrying the unbalanced load assuming one side only of the panel loaded.

6. Floor slabs at walls shall be considered as simply supported.

7. If the portion of the slab adjacent to a wall column is assumed as a cantilever, the wall column or pier shall be capable of resisting the unbalanced moment produced by such cantilever.

8. Bars for negative moments shall extend to the quarter points of the span, with proper consideration for bond and anchorage if such bars exceed $\frac{3}{4}$ inch square.

Section 9.520. **Reinforcement Placing.** Reinforcement bars in concrete shall be securely fixed to the positions required. Spacing of slab bars shall be not greater than 1.5 times the slab thickness. Parallel bars in beams shall be not less than three (3) diameters apart, center measurement, nor less than one (1) inch. The clear spacing between layers of bars shall be not less than one (1) inch. Shrinkage reinforcement shall be not less than $\frac{1}{4}$ inch round bars two (2) feet on centers across slabs reinforced in one (1) direction.

Section 9.521. **Protection of Reinforcement.** Steel reinforcement shall have a minimum protection of concrete on all sides as follows:

Columns, beams and girders.....	2 inches
Floor and roof slabs and walls.....	1 inch
Footings and foundations	2 inches

In all cases sufficient bond shall be provided.

Section 9.522. **Splicing Reinforcement.** Reinforcement splices shall lap a sufficient amount to insure the development of the full strength of the steel. Vertical column bars larger than $1\frac{1}{4}$ inches shall be spliced by welding, or pipe sleeves, or other secure splice to insure the positive transmission of compression.

Section 9.523. **Mixing and Placing.** Concrete shall be so mixed, transported and placed that the full designed strength is assured consistently throughout the structure.

Section 9.524. **Forms.** Form work shall be so placed and secured that the designed shapes and concrete strength is assured consistently throughout the structure. Forms shall not be removed before sufficient strength of the con-

crete has been secured to insure its stability, and except upon the special written permission of the Superintendent of Buildings, the following time allowable for stripping shall be not reduced: Walls and columns—seven (7) days; Floor and ceiling slabs—ten (10) days; Beams and girders—twenty (20) days.

Section 9.600. Steel Trusses. Steel trusses may be of tubing or structural shapes, and may be welded, riveted, bolted or otherwise fastened, so that the stresses are carried in an adequate manner consistent with the permanency of the steel itself.

Where gas or electric arc welding is used, the spliced section shall be built up so that the metal at the splice is such that at least a consistent strength is provided for the whole. A safe value is fifty (50) per cent greater section at the weld. The Superintendent of Buildings may require the test of specimens and a demonstration of the competency of workmen on this class of construction.

Electric spot welding is permissible but subject to test for design strength. Sufficient sway and lateral bracing shall be provided throughout.

Section 9.601. Design. Steel trusses shall be so designed that the whole is statically determinate, disregarding rigidity of joints.

Section 9.602. Steel Girders and Beams. The thickness of the web in built-up girders shall be not less than $1/120$ of the distance between the flange angles or stiffeners, nor less than $1/4$ inch.

When the unsupported length (1) of the compression flange of a girder exceeds ten (10) times its width (b) the unit stress in such

flange shall not exceed $16,000 - 150 \frac{1}{b}$. The length and width are in inches. The unsupported

ported length of the compression flange shall not be greater than forty (40) times its width.

Stiffeners shall be provided over supports, and under concentrated loads, and shall be sufficiently fastened or secured to transmit the stresses of the web.

If the unsupported depth of web plate exceeds sixty (60) times its thickness, intermediate stiffeners shall be provided. All stiffeners shall be in pairs with close bearing against the flange angles.

On masonry bearings, plates or cast seats shall be provided to distribute the load within allowable limits.

Section 9.603. Riveting of Steel. The distance from the edge of the hole to the edge of the piece shall not be less than $1.5 d$, where d is the diameter of the hole. Rivets shall be machine driven wherever possible. The pitch of rivets shall not be less than three (3) diameters of the rivet, nor more than eight (8) inches.

Section 9.604. Protection of Steel Members. All structural metal work shall be cleaned of all scale, dirt and rust and except when embedded in cement or concrete shall be thoroughly coated with at least one (1) coat of non-corroding paint before leaving the shop or before erection. After erection, all places left for shop marks, all abrasions, and all rivet heads and bolts shall be painted, after which the entire frame shall be painted with at least one (1) additional coat of tint different from the first.

All iron or steel used below the ground water level shall be inclosed by Portland cement concrete.

9.7 WOOD CONSTRUCTION

Section 9.700. Wood Beams and Joists. Beams and joists in fire or party walls shall be separated from any other beam on the opposite

side of such wall by at least six (6) inches of tight masonry. All such beams or joists shall be self-releasing. All beams shall have adequate bearing areas.

Section 9.701. Thickness of Wood Beams and Joists. No wood beam or joist shall be less than two (2) inches in thickness, commercial size.

Section 9.702. Anchors for Beams and Joists. Beams and joists shall be anchored, when in masonry walls, at least every six (6) feet along the wall. When such beams or joists parallel the wall, anchor straps shall be anchored in the wall and shall cross and be fixed to not less than two (2) such beams, shall extend not less than three (3) feet out from the wall, and shall be not more than six (6) feet on centers. (See Section 8.305.)

Section 9.703. Timber Columns. Timber columns shall be designed according to the table in Section 8.305 or in accordance with the Euler Formula.

$$\frac{P}{A} = \frac{.274E}{(L)^2}$$

(d)

$\frac{P}{A}$ where — is the allowable unit column stress in pounds per square inch, E is the modulus of elasticity; L is the length in inches; d is the least diameter. (For working strengths see Section 8.305.)

Section 9.704. Construction Details. Wood Columns. All columns shall be squared and so anchored as to insure an even and square seat at the bearing ends. Where columns continue through floors, girders or beams shall not separate the bearing ends of columns, but shall be connected by castings or plates or other approved connections. All belts used shall have

iron washers to distribute the stress within the allowances of material strength stipulated in Section 8.305 hereof.

Section 9.705. **Termite Protection.** All wood foundation construction shall be given a thorough and complete approved coating of coal tar creosote or other approved deterrent. Foundation construction shall include all timber below the first floor, as joists, braces, sills, posts and exterior trim. Exterior trim may be treated with zinc chloride in lieu of the creosote above required.

No wood construction shall be placed nearer than six (6) inches to the ground surface, unless approval therefor is obtained in writing from the Superintendent of Buildings.

All masonry foundation construction supporting frame construction shall be either Portland cement concrete or masonry laid up in Portland cement mortar, or other approved equivalent termite resisting construction. All wood resting on masonry which is within twelve (12) inches of the ground surface, whether above or below the first floor, shall be treated as hereinbefore provided for foundation construction and shall be capped with not less than one (1) inch of Portland cement mortar.

On all posts and sills a termite shield shall be provided, continuing completely around the foundation supports and including all supports and piping and so constructed that access to the superstructure by termites crawling from the ground is obstructed by such shield. Shields shall be of sheets of non-corrosive metal projecting at least two (2) inches out from the surface, and bent downward at an angle of forty-five (45) degrees, and shall not exceed 1/16 inch in thickness.

All openings into attics, roof spaces or other

similar openings into unoccupied spaces except spaces below the first floor shall have non-corroding metal screen not larger than sixteen (16) mesh, and the wires of which are not smaller than No. 28 Browne and Sharpe gauge.

All wood forms on concrete construction shall be removed within forty-five (45) days from the pouring of the concrete.

Section 9.706. Frame Buildings. Frame third class buildings may be constructed of single one (1) inch nominal thickness board walls without studs for one (1) story in height where such has cross-partitions at least for every thirty (30) feet of such wall. Two-story third class buildings may be constructed of single wall for the upper story, but shall be supported by studded walls below. Studding shall be not less than 2x3 inches, and shall be so braced to amply carry the loads imposed.

Section 9.707. Bracing Frame Buildings. When frame dwellings are supported by posts, knee bracing shall be provided of sufficient strength to stabilize the structure against movement from wind pressure in any direction. Single wall construction shall be braced with not less than a 2"x6" belt course between the floor and the ceiling.

CHAPTER 10

PRECAUTIONS DURING BUILDING OPERATIONS

Section 10.100. Storage of Materials and Use and Protection of Sidewalks and Streets. Street and sidewalk areas may be used to facilitate building construction upon the following conditions:

1. Sidewalks shall be protected with a substantial board fence at least eight (8) feet high

constructed along the center line of the sidewalk, and decked over to amply protect pedestrians passing below.

2. The street area shall not be used except under very special conditions, in which event application for street use shall be made in writing to the Superintendent of Buildings. A permit therefor shall be approved by the Superintendent of Buildings and the Chief Engineer of the Department of Public Works, and shall be for a period not to exceed twenty (20) days. A new permit may be issued for further time if deemed advisable.

3. Depositing of materials, excavated earth, or debris on sidewalk or street areas shall not exceed twenty-four hours. This provision shall not be defeated by replacement of new material. Provided, however, that a permit therefor may be issued as hereinbefore provided.

4. Where sidewalk areas are excavated for basement areas or foundations, the street area beyond the curb shall be supported and protected by suitable retaining walls and the sidewalk area shall be maintained with suitable and safe temporary planking as provided in Paragraph 1 hereof.

Section 10.200. Protection of Public. Whenever an excavation is made for building, or material is stored, or blasting is being done, or the usual condition of the public ways disturbed in such manner as to produce a dangerous condition, the person causing any such condition shall maintain proper safeguards either by proper persons posted to warn the public, or by other approved means as railings, guards, signs or warnings, and at night by red warning lights conspicuously posted.

Section 10.300. Protection of Workmen. Temporary construction, scaffolding, ladders, stays, cables, hoists, temporary electrical lines, gangways, staging and similar temporary devices used in construction shall be substantially guarded, constructed and maintained to insure all reasonable safety to the workmen employed on the premises, and it shall be the duty of the Superintendent of Buildings to investigate and report upon the responsibility of all serious accidents on construction work to the Board of Supervisors as to the adequacy of precautions on the work, and in general to see that all reasonable precautions are taken on all construction work under his supervision.

Section 10.400. Protection of Adjacent Property. The depth of ten (10) feet below the adjacent curb elevation is hereby fixed as the standard depth of foundations. Any person excavating to a greater depth than the above standard shall protect the adjoining property from any damages from such excavation. No person constructing foundations to the standard depth or less shall be liable for damages to adjoining property, provided, however, that the Superintendent of Buildings shall be given due notice of the possible damage or danger. It shall be the duty of the Superintendent of Buildings, upon receipt of such notice, to examine the premises and notify the owner of the threatened building, his opinion of the work necessary to make his structure safe, and the owner of the threatened building shall have the right to enter upon the property of the adjoining owner in order to do the work necessary to make his building safe. Such work shall be promptly and expeditiously carried out so as to interfere as little as reasonably possible with the construction of the adjoining owner, and in the event

of controversy the Superintendent of Buildings shall decide the questions at issue.

Section 10.500. Utility and Sanitation Requirements. All construction work shall provide sufficient toilets or portable approved latrines for the accommodation of the workmen, or arrangements made for the use of such accommodations upon adjoining premises.

CHAPTER 11

FIRE PROTECTION

Section 11.100. Fire Resistive Materials. Whenever any new material is proposed not enumerated in Chapter 2 as "Fireproof" or "Fire Resisting," the National Board of Fire Underwriters' tests thereon shall be considered as a comparative guide for the determination of its classification.

Section 11.200. Protection of Wall Columns. All columns which support steel girders carrying exterior walls, and all columns which are built into walls and support floors only, shall be protected against corrosion by a coating of Portland cement mortar at least one-fourth ($\frac{1}{4}$) inch thick, and against moisture and fire by a casing of masonry which shall be not less than four (4) inches of brick or three (3) inches of concrete on all surfaces; all to be well bonded into the masonry of the enclosing walls. In the event concrete is used the initial plaster coat may be omitted.

Section 11.201. Protection of Wall Girders. The wall girders shall have a casing of Portland cement mortar and the same masonry protection as required for wall columns, all to be securely tied and bonded; but the extreme outer edge of the flanges of beams, or plates or angles connected to the beams may project within two

(2) inches of the outside surface of such casing. The inside surfaces of the girders shall be similarly protected by masonry, or if projecting inside the walls, they shall be protected by concrete, terra cotta, or other approved fireproof material not less than two (2) inches thick.

Section 11.202. Protection of Other Structural Members. All metal structural members which support loads or resist stresses other than those provided for by the two (2) preceding paragraphs shall have a protection of fireproofing as herein specified. The protection material shall be brick, concrete, tile or gypsum block. Concrete shall be not weaker than a 1:2:4 mixture. Tile may be solid or hollow, and shall be porous or semi-porous; neither shells nor webs shall be less than five-eighths ($\frac{5}{8}$) inch thick. Gypsum blocks shall be solid and of quality approved by the Superintendent of Buildings. Plaster shall not be considered a part of any required fireproofing for metal structural members except where specifically mentioned as such.

Section 11.203. Mortar for Masonry Fireproofing. All bricks or blocks used for fireproofing shall be set in Portland cement mortar, except that gypsum blocks may be set in gypsum mortar.

Section 11.204. Protection of Interior Columns.

1. The protection shall cover the columns at all points to a thickness of not less than three (3) inches and be continuous from the base to the top of the column. The extreme outer edges of lugs, brackets and similar supporting metal may project to within one (1) inch of the outer surface of the protection.

2. If brick or blocks are used for fireproofing columns, they shall be accurately fitted, laid with broken joints, and all spaces between the

outside layer and the metal solidly filled with masonry; or a concrete filling may be used. No voids between the metal and the protecting casing shall be permitted.

3. Galvanized steel wire, not smaller than No. 12 gauge, shall be securely wrapped around block column coverings so that every block is crossed at least once by a wire. The wire shall not be wound spirally around the column, but each turn or band shall be a separate unit and shall be twisted tightly or otherwise securely bound. Other equivalent anchorage may be employed if approved by the Superintendent. No block used for this purpose shall exceed twelve (12) inches in vertical dimension.

Note: Any method which would securely lock the blocks in place, or hold them by substantial interior metal ties, would be superior to the wire wrapping above described.

4. Columns located in damp places shall receive a coat of at least one (1) inch of Portland cement mortar before application of the fireproofing.

5. Columns made of steel or wrought iron pipe filled with concrete shall be protected by at least one and one-half (1½) inches of fireproofing.

6. Where the fireproofing of columns is exposed to damage from trucking or handling of merchandise, the fireproofing shall be jacketed on the outside for a height of not less than three (3) feet from the floor with metal or other approved covering.

Section 11.205. Protection of Steel Girders and Beams.

1. The protection of the webs and bottom flanges of girders and all members of trusses shall have a thickness of not less than two (2)

inches at all points. The protection of the webs and bottom flanges of beams, lintels and all other structural members shall be not less than one and one-half ($1\frac{1}{2}$) inches at any point.

2. If hollow clay tile be used for protection, the lower flanges of beams and similar members shall be encased either by lugs which form part of the skewbacks and extend around the flanges meeting at the middle; or by tile slabs held in position by dove-tailed lugs projecting from the skewbacks. In either case care shall be taken to insure that all joints be solidly filled with mortar.

Section 11.206. Concrete Protection for all structural members shall be held in position by suitably designed interior steel anchors hooked securely around the flanges or angles of the members at intervals not exceeding eight (8) inches apart; these anchors shall be not less than one-eighth ($\frac{1}{8}$) inch in thickness if flat or one-tenth ($1/10$) inch in diameter if of wire, and shall be located at a distance not less than three-fourths ($\frac{3}{4}$) inch, nor more than one (1) inch from the outside surface. Provision shall be made to prevent displacement of anchors while concrete is being deposited. When the flange width of steel members exceeds six (6) inches, the wire used for anchoring the concrete protection shall be not less than one-eighth ($\frac{1}{8}$) inch diameter.

Section 11.207. Steel Angle or Channel Struts, or other structural framing not elsewhere provided for, which are used for support in any wall, partition or other construction, shall be fireproofed as required in this section, or in Section 11.211, paragraph 4.

Section 11.208. Metal Panels on the exterior of buildings over one (1) story high shall be

backed up or filled in with masonry not less than eight (8) inches thick.

Section 11.209. Miscellaneous Fireproofing Provisions.

1. Defective or damaged fireproofing materials shall not be used. All fireproof construction injured or damaged after being erected shall be repaired to the satisfaction of the Superintendent of Buildings before any filling or finish is placed over same.

2. No pipes, wires, cables or other material shall be incased within or embedded in the required fireproof protection of columns or other structural members.

3. All metal lath and plaster ceilings shall be supported by hangers or clamps attached to the floor or roof construction in an approved manner. Such supports shall be of such section and weight as will support the wet plaster without deflecting more than one-thirtieth ($1/30$) inch per foot of span.

4. All studding for metal lath partitions or wall furring shall be made from steel stock weighing not less than 0.5 of a pound per lineal foot, shall be spaced not over sixteen (16) inches center to center and shall be securely fastened to the floor and ceiling construction.

5. Metal lath shall be of galvanized steel weighing not less than fifty-four (54) ounces per square yard. Wire lath shall be not less than No. 20 gauge, and sheet metal lath not less than No. 24 gauge. Metal lath shall be laced to the supporting furring or studs at intervals not exceeding six (6) inches. Where lath is back-plastered it need not be galvanized.

6. After floors are constructed, no opening greater than two (2) square feet shall be cut through them unless suitable metal framing or reinforcing is provided around the opening.

After pipes or conduits are in place, all openings around them shall be filled in solidly with fireproofing material unless approved close fitting individual sleeves are provided.

Section 11.210. Protection of Metal Structural Members in Non-Fireproof Buildings. Steel girders and steel or iron columns which support masonry walls, other than those facing upon a street, shall be protected by at least two (2) inches of fireproofing of the same materials and applied in the manner specified hereinbefore for wall girders; or by two (2) inches of metal lath and cement plaster, the latter being applied in two (2) layers with an air space between them. All other iron or steel columns shall be protected by at least one (1) inch of metal lath and cement plaster or its equivalent. The lath shall be of quality specified in Section 11.209, paragraph 5.

Section 11.211. Partitions in First Class Buildings.

1. In fireproof buildings, all partitions enclosing public halls or separating the spaces occupied by different tenants, and all other permanent partitions, shall be built not less than four (4) inches thick, of solid or hollow brick, terra cotta, concrete or gypsum blocks or tile; or not less than two and one-half (2½) inches thick of reinforced concrete or solid metal lath and cement plaster; or of such other incombustible materials and thickness as shall meet the Standard Fire Test for Partitions of the American Society for Testing Materials. The required thickness for block or tile partitions shall be exclusive of plaster. All such partitions shall be securely fastened to the fireproof construction of the floor and ceiling. All bricks, blocks or tile shall be laid with broken joints.

2. All partitions not enumerated above shall be of incombustible materials, except for wood-work permitted in Section 3.200.

3. All partitions in fireproof buildings shall be independently supported at each floor level, and where lateral support is not sufficient they shall be stiffened by such steel reinforcement encased in the construction as the Superintendent of Buildings may require and approve.

4. Structural steel members necessary for supporting a partition, or for framing doorways or other openings through it, shall be protected by at least one (1) inch of fireproofing. Cement plaster, or cement-tempered plaster, may be accepted for this purpose if properly keyed.

5. Reinforced concrete for partitions shall have a compressive strength of 2,000 pounds at twenty-eight (28) days. Clay tile shall be porous or semi-porous in quality, and if hollow shall have two cells in the thickness, with the thickness of shells inclusive of plaster key not less than three-fourths ($\frac{3}{4}$) inch, and the thickness of webs not less than five-eighths ($\frac{5}{8}$) inch. The shells and webs or hollow gypsum or concrete blocks or tile shall be not less than three-fourths ($\frac{3}{4}$) inch. Gypsum shall be used only in dry locations. Metal lath and studding shall conform to the requirements of Section 11.209.

6. If a stair hallway be considered as a part of the stairway, and the latter is not separately enclosed as required by Section 11.500, then the enclosing partitions for the hallway shall be considered as the stairway shaft, and shall be enclosed with masonry walls of eight (8) inch hollow concrete blocks, six (6) inches of hollow clay tile, or five (5) inches of reinforced concrete.

7. If the partition surrounding a public hallway be erected in accordance with the require-

ments for a fire exit partition, it may be considered as a horizontal exit for an occupancy equal to the area of the hallway in square feet divided by three (3).

Section 11.212. Fire-resistive Partitions in Second Class Buildings.

1. In Second Class non-fireproof buildings all partitions enclosing public hallways, or separating the spaces occupied by different tenants, shall either be built as required in Section 11.211, or they may be built of not less than 3-inch approved solid or hollow partition blocks or tile, or by 3-inch hollow or 2-inch solid metal studding and lath with cement plaster, or by 2x4 inch wooden studding with wood or metal lath and three-fourth ($\frac{3}{4}$) inch of cement or cement-tempered plaster on each side; or of any other materials and thickness as shall meet the requirements of the partition fire test as prescribed by the American Society for Testing Materials for Fireproof Partitions. Wooden studs shall be set with 4-inch dimension at right angles to the plane of the wall.

2. All such partitions shall be fire-stopped the full depth of the floor beams at each floor level by filling with tight-fitting brick or concrete or other approved means.

3. The principles governing hallway partition construction, as stated in Section 11.211, paragraphs 6 and 7, shall apply to the construction of like partitions in non-fireproof buildings.

Section 11.213. Steel Roof Truss Protection. In lieu of the protection for steel members hereinbefore stipulated, a metal lath ceiling shall be deemed protection of the truss members. See Section 11.700.

Section 11.500. Vertical Openings. In all First and Second Class Buildings which are to be used or used for any purpose other than a dwell-

ing the stair walls, elevator shafts and all such openings connecting from one floor to another shall be enclosed by not less than eight (8) inches of brick or concrete blocks, or five (5) inches of reinforced concrete, or six (6) inches of hollow clay tile, with self-closing or automatic fire doors protecting all openings into such shafts.

Section 11.600. Wall and Partition Openings. Fire Doors and Shutters. Every exterior opening in all sides of buildings within the fire limits not abutting a street shall have metal-covered shutters or doors, constructed and arranged as specified in this Section, or in lieu thereof may have frames and sashes of hollow metal glazed with 24 B & S gauge wire glass not less than one-fourth ($\frac{1}{4}$) inch thick, no pane in which shall be larger than twenty-four by thirty (24x30) inches.

Rolling steel shutters may be used on the first story only.

Fire doors and shutters shall be constructed of two (2) thicknesses of matched boards not over six (6) inches wide, at right angles to each other, or crossing diagonally, nailed with wire nails, clinched, and securely covered with tin on both sides and edges, sheet to be not larger than ten by fourteen (10x14) inches in size, put together with tin roofers' lock joint and securely nailed, the nails to be driven inside the lap and the joints hammered down over the nail heads. No solder shall be used. Doors shall never be less than two (2) inches thick, nor shutters less than one and one-half ($1\frac{1}{2}$) inches thick.

In tin-clad doors a vent hole shall be cut through one of the plates near the middle of the exposed side of the completed door or shutter. This vent hole shall have a diameter of three (3) or four (4) inches, but shall not cut

through the wood core. The plate around the vent hole shall be secured with small nails spaced one (1) inch apart, and the exposed wood thoroughly painted.

Hinges and hangers shall be of wrought iron and fastened to the door or shutter with bolts. Latches shall be so arranged on shutters that they can be opened from either side.

Swinging doors and shutters shall extend at least one (1) inch below top of sill, or they may close into the opening provided the wall be rabbetted one and one-half (1½) inches at the top and sides and one (1) inch at the bottom.

All sliding doors shall extend at least three (3) inches over the masonry at sides and top of doorway or opening, and one (1) inch below top of sill.

Sliding doors may run at the bottom in a channel iron so set as to give the door a bearing of one (1) inch below the top of sill.

Sills, except in exit doors in theaters, shall break the floor and rise at least one (1) inch above floor level to prevent passage of flame and smoke, and be constructed of metal, masonry or concrete. Wood sills shall not be used.

Rail or track for sliding doors or shutters must be heavy enough to withstand heat without warping, and may be made of angle or channel iron, and both rails must be secured to wall whenever possible by bolts passing through the wall, otherwise expansion bolts shall be used. In lieu of channel or angle iron, the track can be made of common flat bar steel not less than three-eighths ($\frac{3}{8}$) inch thick and four (4) inches wide, bolted through the wall with three-fourths ($\frac{3}{4}$) inch bolts or fastened with heavy expansion bolts.

Binders shall be placed so as to prevent the

door from rolling off the track at either end, and also to hold it in position when closed.

Section 11.700. Ceilings. All ceilings, including basement ceilings, of Second Class buildings shall be of lath and plaster, or other minimum equivalent fire-resistive covering. If the basement is not to be occupied or used for storage, and only sufficient space exists for ventilation, such ceiling need not be plastered. All suspended ceilings in First Class buildings or ceilings protecting truss construction shall be plaster on metal lath. Any openings in ceilings of either First or Second Class buildings shall be carried through the roof with partitions protecting the roof space of not less than two (2) inches of metal lath and cement plaster, completely embedding the metal lath. Metal lath shall be as described in Section 11.209. The foregoing does not apply to a ceiling scuttle, which shall be of fire-resisting construction, including the frame.

Section 11.810. Wood Shingles. Within the Fire and Industrial Districts the use of wood shingles or other forms of combustible roofing other than felt tar and gravel is prohibited.

Section 11.820. Skylights. All skylights in buildings of classes one and two shall be of corrugated or prismatic wire glass not less than one-fourth ($\frac{1}{4}$) inch thick, set in a metallic frame.

Section 11.830. Pent Houses, Tanks, etc. All structures built on the roof of buildings shall have the walls, openings and roof construction and coverings in conformity with the requirements for the remainder of the building. Provided, however, that ventilators and skylights may be made of sheet metal or sheet metal and wire glass with proper fire protection in the in-

terior shafts and screen or other protection on the outside to prevent the entrance of flying brands, and provided further that the walls and ceilings of pent houses in Second Class buildings may be metal lath, plastered two (2) sides, when such does not exceed eight (8) feet in height.

Section 11.900. **Fire Stopping.** All partitions in Second and Third Class buildings shall be so constructed that the top and bottom is sealed against fire by wood sills four (4) inches in thickness at the top and two (2) inches in thickness at the bottom, or other approved method. In Second Class buildings the plaster shall be carried down below and up above the solid sills so as to form a tight covering, and to prevent fire entering readily into the partition. Tight partitions of 1x6 T & G shall be placed in attics over 1,000 square feet in area to act as a fire stop in all Third Class buildings.

Section 11.910. **Fire Pipe Lines.** Every building of three (3) stories or more in height shall have inside or outside of the exterior walls one (1) or more metallic standpipes at least four (4) inches in diameter, which shall extend from four (4) feet above the sidewalk to and over the roof and rest on the fire walls, and at each story there shall be branches with three-inch (3") gate valves with reducer from three (3) inches to two and one-half (2½) inches, provided with cap and chain; and there shall be a two-way Siamese inlet with two and one-half (2½) inch connection attached to each standpipe four (4) feet above the line of the sidewalk; and a two-way outlet over the roof with two (2) three-inch gate valves with reducer from three (3) inches to two and one-half (2½) inches, provided with cap and chain. All hose connections to fit the standard connections

of the Fire Department of the City and County of Honolulu.

All iron or steel material used in the construction and erection of standpipes shall be galvanized and shall be kept in good order and repair and free from any and all obstructions.

All standpipes shall be capable of sustaining a hydrostatic pressure of three hundred (300) pounds to the inch throughout their entire length after the same are erected. (See Section 7.100.)

CHAPTER 12

CHIMNEYS AND HEATING APPLIANCES

Section 12.100. **Chimneys and Flues.** All chimneys of masonry or concrete construction shall have walls at least eight (8) inches thick, or in dwellings may be constructed of 4-inch brick walls with an inside lining of terra cotta or well-burnt clay pipe not less than one (1) inch thick. No chimney shall be built on wooden brackets or supports. No smoke pipe shall project through any external wall or window except flue pipes from gas burning water heaters or similar appliances.

All chimneys shall have at least one (1) inch of clear space between the chimney masonry and any wood framing or wood construction of the building.

CHAPTER 13

SPECIAL OCCUPANCY PROVISIONS

Section 13.100. **Theaters.** All theaters hereafter built within the City and County of Honolulu shall be of First Class construction. The City and County Treasurer shall not issue a license for any performance in any such building until a certificate in writing has been issued,

signed by the Superintendent of Buildings and the Chief Engineer of the Fire Department, that the requirements of this Chapter have been complied with.

All theaters shall have at least one (1) frontage on the street or on a right of way free to the patrons of the theater and which right of way is not less than sixteen (16) feet wide which opens directly onto a street. In such front there shall be suitable and ample means of entrance and exit. There shall also be on each side of the exterior of the theater building an open court or space for use as a means of exit by the patrons of the theater, each of which courts or spaces shall be not less than eight (8) feet wide and shall extend the full length of the building. These courts or spaces and rights of way shall be kept clear during performances.

Opening from the auditorium into these courts or spaces there shall be not less than two (2) exits from each floor and each gallery; these openings shall be closed by doors easily opened from the inside by pressure during all performances. They shall be of ample width and shall swing outward in such a way as not to block the balcony upon which they open. All such exits must open from the aisles.

The exterior balconies upon which these exits open, and the stairways leading to the ground, must be not less than four (4) feet wide, and shall be constructed of iron, steel or other non-combustible construction of ample strength to safely sustain a load of one hundred (100) pounds per square foot, with a factor of safety of four (4).

There shall be also one (1) exit on each side of the stage into the courts or spaces.

At each and every exit in any theater in the City and County of Honolulu there shall be

placed and maintained a lamp in which only mineral, nut or other low flash oil, or electricity upon an independent circuit, shall be used, and said lamp or lamps shall be lighted previous to the opening of the doors of such theater for any performance therein and shall be kept lighted until the audience shall have departed from the premises, and there shall be inscribed upon said lamp or lamps the word "Exit" in distinctly visible letters not less than six (6) inches high.

Stairways shall have handrails on each side firmly secured to strong supports or to the walls. There shall be no flight of more than twenty (20) steps, there shall be no winders, and no step shall be less than four (4) feet wide in the clear. Such steps shall have a rise not greater than six (6) inches and a tread not less than ten (10) inches.

There shall be a fire wall of brick or reinforced concrete above the proscenium arch and between the stage and the auditorium, which wall shall extend at least three (3) feet above the roof. The proscenium shall be the only opening in said wall above the level of the stage, and all openings through this wall below the stage level shall be provided with self-closing fire doors, constructed as provided in Section 11.600. The wall above the proscenium arch shall be supported by reinforced concrete girders or by steel girders covered with fireproof material, or other approved construction.

The proscenium opening shall be provided with a curtain of asbestos or fireproof material, sliding at each end in grooves securely fastened to the masonry wall, and extending into such grooves to a depth of not less than four (4) inches. The fireproof curtain may, however, be furnished with steel cable guides not less than one-quarter ($\frac{1}{4}$) inch in diameter; provided,

that such curtain laps over the stage opening at the sides and top for a distance of not less than eight (8) inches, and that attached to said curtain at the top and bottom, to full width thereof, shall be wrought iron or steel pipe or other approved stiffeners of not less than one and one-fourth ($1\frac{1}{4}$) inches diameter. The fireproof curtain shall be kept lowered between acts, during intermissions, and at the close of each performance, except during rehearsals. The curtain shall be hung not nearer to the footlights than three (3) feet.

All seats except those in the boxes shall be firmly fastened to the floor, and no seat in the auditorium shall have more than seven (7) seats intervening between it and any aisle adjacent. Seats shall not be less than thirty-one (31) inches from back to back, nor less than twenty (20) inches in width, center to center measurements.

Center aisles and passageways shall be at least forty-eight (48) inches wide at the narrowest point, side aisles at least thirty-six (36) inches, and all shall increase in width toward the point of exit at least one-quarter ($\frac{1}{4}$) inch for each foot of length. The grade of aisles shall not be greater than one and one-quarter ($1\frac{1}{4}$) inches per foot.

A ventilator shaft of capacity equivalent in area to the skylights hereinafter mentioned, lined with fireproof material, shall be placed over the center of the stage and shall extend at least three (3) feet above the roof. The roof over the stage shall be provided with skylights in area equal to one-fourth ($\frac{1}{4}$) of the stage area, and said skylights shall be made to open automatically in case of fire.

Theater floors shall be of sufficient strength

to support an imposed live load of one hundred (100) pounds per square foot.

Every theater shall be equipped with at least two (2) lines of standard three-inch (3") cast iron or galvanized water pipe, leading directly from the street main, and provided with the standard coupling of the Fire Department, with not less than twenty-five (25) feet of hose attached. Such water pipe and hose shall be ready for immediate use at any time during the performance in said building. The stage area, above and below, shall be equipped with automatic sprinklers as provided by Chapter 19 hereof.

Electric wires, footlights and all apparatus for extinguishing fires or guarding against the same shall be in charge of and under the control of the Fire Department, and the Chief of said Department shall be responsible for the execution and enforcement of this regulation.

Gradients or inclined planes shall be employed instead of steps to overcome slight difference of level in or between aisles, corridors and passages.

Walls separating the actors' dressing rooms from the stage and partitions dividing the dressing rooms, together with partitions of every passageway from the same to the stage, and all partitions on or about the stage, shall be constructed of fireproof material. All shelving and cupboards in each and every dressing room, property room or storage room shall be constructed of fireproof material. Dressing rooms may be placed in the fly galleries, provided that proper exits are secured therefrom to fire escapes in the open courts and that the stairs leading to the same shall be fireproof. Dressing rooms shall have an independent exit, leading directly into an open court or street, and shall

be ventilated by windows in the external wall; and no dressing room shall be more than one (1) story below the street level. All windows shall be arranged to open, and none of the windows in outside walls shall have fixed sashes, iron grills or bars. Moving picture machines shall be enclosed in fireproof booths, with a fireproof ventilator and self-closing fireproof doors and shutters opening into the theater.

If any arrangement or construction or appliance of any theater is unsafe to life, full authority is hereby vested in the Superintendent of Buildings and the Chief Engineer of the Fire Department, or either of them, to order and enforce such changes or additions as may be necessary.

Section 13.200. Moving Picture Houses. Buildings outside the fire limits, which contain no balconies and only a small stage and little or no movable scenery, shall be First Class buildings. Such buildings shall have exit facilities, moving picture booth construction, exit lights, seat arrangement and spacing, doors opening outward with self-release bars, floor gradients, aisle spacings, unobstructed passages and outside passage areas the same as required for theaters provided in Section 13.100 of this Code. In addition, fire extinguishers or hose lines shall be provided as deemed necessary by the Superintendent of Buildings and the Chief Engineer of the Fire Department, or either of them.

Section 13.300. Places of Instruction. No school or place of instruction over one (1) story in height shall be of Third Class construction. Second Class buildings constructed for this purpose shall have exits so arranged that no matter in what portion of the building fire might occur, at least one (1) exit shall be accessible.

No Second Class building for the above use shall exceed two (2) stories in height.

Section 13.301. **Refrigeration Plants.** All refrigeration plants which employ ammonia or other toxic gas as the refrigerant shall be so constructed that the entire ammonia system may be flushed into the sewer by control waves outside the building in case of fire or break in the lines.

CHAPTER 14

ELEVATORS

Section 14.000. **Elevators.** The term "elevator" as used in this Code shall include all elevators or lifts used for carrying passengers or freight. The term "dumbwaiter" shall include such special form of elevator the dimensions of which do not exceed six (6) square feet in horizontal section and four (4) feet in height, and which is used for the conveyance of small packages and merchandise.

Any hand-power elevator having a rise of less than thirty-five (35) feet need not comply with all the requirements of this section. No belt driven from a countershaft shall be installed for passenger service.

Section 14.010. **Application for Installation or Alterations.** Before any elevator shall hereafter be installed or altered in any building, the owner shall submit, on appropriate blanks furnished therefor, to the Superintendent of Buildings an application in duplicate stating the construction and mode of operation of such elevator to be installed or altered, accompanied by such plans and drawings as may be necessary, and shall obtain his approval therefor. Before any such elevator shall be put into service,

the same shall have been duly tested and inspected by the Superintendent of Buildings and a certificate of inspection and approval obtained. In making any changes or alterations to elevator shafts, rails, overhead machinery or power, all the work changed or altered shall be made to conform to these regulations.

Section 14.020. Capacity Plate. The owner of any elevator now in operation and the manufacturer of any such elevator hereafter placed in any building shall cause to be fastened in a conspicuous place in said elevator a metal plate having suitable raised letters on same which shall designate the number of pounds which said elevator shall be permitted to carry, but in no case shall a carrying capacity of less than one hundred (100) pounds per square foot of platform area inside the car be permitted on any passenger elevator.

Section 14.030. Operator. Every elevator, except full automatic push button elevators, shall be in charge of a competent, reliable operator not less than eighteen (18) years of age, who shall have had at least one (1) week's experience in running an elevator under the constant supervision of a person who has received a certificate of competency as an elevator operator.

Section 14.040. Operator to Register. No person shall run any passenger or freight elevator in the City of Honolulu unless he shall first register at the office of the Department of Buildings his name and residence, also the location of the building in which he is to perform such service, and shall first receive from the Superintendent of Buildings a certificate of competency.

Section 14.050. Doors. Not more than one (1) door opening in the elevator shaft shall be al-

lowed on each floor, and all openings in the several stories shall be one above the other, except where the operating device of the elevator is so placed that the operator can readily control all doors without leaving the car control, in which case more than one door opening may be permitted on a floor.

Section 14.060. Safety Device on Doors. All elevators hereafter installed in vertical shafts shall be controlled by a mechanical device that will automatically prevent the car being moved until the shaft door or gate at which the car is standing is shut and securely fastened, and which will prevent the opening of any shaft door or gate until the car has come to rest at the landing. All doors or gates opening into existing elevator shafts shall be locked or bolted in a manner to permit opening only by the operator of the car.

Section 14.070. Counter Weights. All counter weights shall have their sections strongly bolted together. There shall be not less than three (3) feet clearance between the top of counter weights and the under side of overhead beams when the car is resting on the bumpers. No continuous forged strips shall be permitted on counter weights.

Section 14.080. Incombustible Construction. Elevator cars shall be constructed of incombustible materials, except that flooring may be of hardwood. There shall be not more than one and one-fourth ($1\frac{1}{4}$) inches space between the floor of the car and the floor saddles, and where the saddles project into the shaft the same shall be properly beveled on the under side. The under side of the car shall be of incombustible materials. Cars for all elevators shall be properly lighted.

Section 14.090. Guide Rails. All guide rails for both car and counter weights shall be of steel, and shall be bolted to the sides of the shaft with steel or cast iron brackets, so spaced that the guide rails will be rigid. The splices in the rails shall be located as near such rigid supports as possible.

Section 14.100. Combination Freight and Passenger Elevator Prohibited. No passenger elevator shall be permitted to have a freight compartment attached to it in any manner.

Section 14.110. Grating under Sheaves. Immediately under the sheaves at the top of every elevator shaft in any building there shall be provided a concrete slab or substantial grating of steel having not more than one (1) inch space between the members of said grating, and of such construction as shall be approved by the Superintendent of Buildings.

Section 14.120. Clearance, Top and Bottom. A clear space of not less than three (3) feet shall be provided between the bottom of the shaft and the lowest point of the under side of the car floor when the car is at its lowest landing; and between the top of the crosshead of the car and the under side of the overhead grating when the car is at its top landing; except that this latter space shall be not less than five (5) feet for elevators having a speed in excess of 350 feet per minute, and may be reduced to two (2) feet for elevators having a total rise not exceeding thirty (30) feet, and a speed not exceeding one hundred (100) feet per minute.

Section 14.130. Incombustible Partitions. All parts of the elevator machinery shall be enclosed by suitable partitions of incombustible materials, and such inclosures shall be lighted. Free and safe access shall be provided to all

parts of elevator machinery. Where the machine is located at the bottom of the shaft it shall be protected with a substantial pit pan.

Section 14.140. **Buffer Springs.** At the top and bottom of all elevator shafts there shall be placed substantial springs for car and counter weights.

Section 14.150. **Capacity of Structural Supports.** The carrying beams and other supports for all machinery shall be of steel designed for double the live loads to be supported.

Section 14.160. **Trap Door in Cage.** Every passenger elevator shall have a trap door in the top of the car of such size as to afford easy egress for passengers, or where two (2) cars are in the same shaft such means of egress may be provided in the side of each car.

Section 14.170. **Inspection.** The Superintendent of Buildings shall cause an inspection of elevators carrying passengers or employees to be made at least once every three (3) months, and shall require any necessary repairs to be made promptly by the owner. If the Superintendent at any time considers an elevator to be unsafe, he may require its operation to cease until such repairs or alterations have been made as will in his judgment produce safety. In lieu of such inspection by his own Department, the Superintendent may accept the report of inspection made by other reliable and properly constituted persons which in his judgment are competent and satisfactory.

Section 14.180. **Elevator for Fire Department.** In every building exceeding one hundred (100) feet in height at least one (1) passenger elevator shall be kept in readiness, without operator, for immediate use by the Fire Department during all hours of the night and day, including holidays and Sundays.

Section 14.190. Safety Devices. It shall be unlawful to use any elevator that is not provided with safety devices for bringing the elevator car to rest without serious injury to passengers or operator whenever it may for any reason exceed its rated speed by more than forty (40) per cent or reach a speed of 850 feet per minute. Safety devices are not required upon the plunger type of elevators, nor upon sidewalk elevators which travel less than thirty (30) feet.

Note: Chapter 15, covering the plumbing provisions of this Code, will be found in Ordinance No. —.

CHAPTER 16

HEATING

Section 16.100. Smoke-Stacks. Smoke-stacks connected to steam boilers under which sawdust, shavings or wood are burned shall extend not less than twenty-five (25) feet above the roof of any adjacent roof, and shall be provided with an approved spark arrester.

Section 16.200. Ranges, Ovens and Similar Devices. Wooden floors under ranges, ovens, kilns, coffee roasters, candy kettles and similar devices shall be protected by a sheet of asbestos not less than one-sixteenth (1/16) inch in thickness covered by a sheet of metal not less than twenty-four (24) gauge extending one (1) foot beyond the base of such device. A layer of properly cemented brick or tile may be used in lieu of the above.

Section 16.300. Boiler Rooms. All walls of boiler rooms situated within Fire Districts Nos. 1 and 2 shall be of masonry, concrete or terra cotta for their full height and the roof shall be of corrugated iron or concrete or asbestos or

other similar covering. If there is a ceiling it shall be of metal, asbestos or plaster on metal lath.

Openings into a boiler room as above described shall have fire doors or shutters, constructed as specified in Section 11.600 of this Code, arranged to close automatically; and where oil is burned under gravity feed, every doorway shall have a masonry, concrete or terra cotta sill rising not less than eight (8) inches above the floor. No wood or other inflammable material shall be used in the construction of the floor of any boiler room.

Boiler rooms outside Fire Districts Nos. 1 and 2 shall be constructed of non-combustible material. Every boiler room where shavings or other refuse are used for fuel shall be provided with a stand pipe connected to the city mains not less than one and one-half (1½) inches in diameter located near the door, with at least twenty-five (25) feet of one and one-half (1½) inch hose attached thereto.

Section 16.301. **Chimneys.** All chimneys shall be constructed in conformity with a Standard Ordinance for Chimney Construction recommended by the National Board of Fire Underwriters, Third Edition, revised 1927.

Note: Chapter 17, covering the electrical provisions of this Code, will be found in Ordinance No. —.

CHAPTER 18

SIGNS AND BILLBOARDS

Section 18.100. Signs Within the Fire Limits. No wood, canvas or other inflammable sign shall be permanently erected within the fire limits. Temporary permits not to exceed ten (10) days may be issued by the Superintendent of Buildings if such is also approved by the Chief Engineer of the Fire Department.

Section 18.200. Signs in All Districts. No sign shall project over the public ways more than three (3) feet. Such projecting signs shall be structurally secure and shall allow at least seven (7) feet passage below.

Section 18.300. Sky Signs. Sky Signs erected on the roof of buildings and other exposed places shall be entirely of metal and non-combustible material excepting necessary wire insulation. No sky sign shall project beyond the building and shall not exceed twenty (20) feet in height, nor shall be nearer the edge of the building or structure than fifteen (15) feet, and shall be designed for a wind pressure in any direction of thirty (30) pounds per square foot of exposed area.

Section 18.400. Billboards. All billboards erected shall be substantially built and the permit application therefor shall be accompanied by the written consent of the owner, and if under lease, by both the owner and lessee. (See Revised Laws prohibiting billboards in certain districts.)

CHAPTER 19

FIRE EXTINGUISHING EQUIPMENT

Section 19.100. **Fire Extinguishers.** Wherever fire extinguishing equipment is required, whether hose lines, chemical tanks or smaller equipment, they shall contain thereon the approval stamp of the Underwriters' Laboratories and shall be subject to regular inspection by the Chief Engineer of the Fire Department, who may order their recharging, arrangement or any other reasonable regulation deemed necessary.

Hose lines shall be on mains carrying the city pressure at the hose end.

Section 19.200. **Sprinkler Requirements.**

1. In all new or existing buildings within the District of Honolulu where additional area is to be allowed any building by the installation of a sprinkler system, such system shall be an approved automatic sprinkler system, so constructed as to protect every square foot of floor area.

2. Sprinkler heads shall be approved by the Underwriters' Laboratories or the Factory Mutual Laboratories of Boston.

3. Sprinkler heads shall be so placed as to protect all parts of the space to be protected, but not over one hundred (100) square feet of area.

4. The size of pipe risers and laterals to serve sprinkler heads shall not exceed the following:

Size of Pipe	Maximum Number of Sprinklers Allowed
$\frac{3}{4}$ inch	1 sprinkler
1 "	2 sprinklers
$1\frac{1}{4}$ "	3 "
$1\frac{1}{2}$ "	5 "
2 "	10 "
$2\frac{1}{2}$ "	20 "
3 "	36 "
$3\frac{1}{2}$ "	55 "
4 "	80 "
5 "	140 "
6 "	200 "

5. Each system shall be provided with an outside screw and yoke gate valve so located as to be readily accessible and to control all sources of water supply to the system, except that for fire engine connections. Drain pipes shall be provided and the system so installed as to drain all parts.

6. All systems shall be wet pipe.

7. Pressure tanks, if used, shall have a total capacity of not less than 4,500 gallons (3,000 gallons of water) and in any event the tank shall have capacity to supply twelve and one-half ($12\frac{1}{2}$) per cent of the greatest number of sprinklers within a fire area on any one floor, for twenty (20) minutes with an average discharge of twenty (20) gallons per minute per sprinkler.

8. Gravity tanks, if used, shall have a capacity of not less than 5,000 available gallons or twice the sprinkler capacity of preceding paragraph.

9. Fire pumps, if used, shall be of not less than 500 gallons capacity per minute and sufficient to supply fifty (50) per cent of the num-

ber of sprinklers within a fire area on any floor with an average discharge per sprinkler of twenty (20) gallons a minute. Pump to have an adequate source of power and be supplied from street main or from well or cistern containing one hour's full supply for the number of sprinklers judged to be open by fire at any one time; suction piping to be well installed.

10. The system shall be connected to a Siamese steamer connection outside of the building by a pipe of diameter equal to that of the largest standpipe supplied. Such connection shall be made on each street front, except that corner buildings having one street frontage of less than fifty (50) feet may have only one (1) connection. Siamese shall be about one (1) foot above the curb level, and shall be provided with check valves, and substantial caps to protect thread on the connection; the thread shall be uniform with that used by the local Fire Department. A suitable iron plate with raised letters shall be provided, reading: "To Basement Sprinkler" or "To Cellar Sprinkler," where only these are installed, or "To Automatic Sprinkler" where entire building is equipped.

11. Piping shall be wrought iron or steel, galvanized, and together with fittings and connections, shall be of such strength as to safely withstand at least 150 pounds water pressure to the square inch for two (2) hours when ready for service, without leaking at joints, valves or fittings; such test to be made by the Chief of the Fire Department.

12. All such sprinkler equipments shall be in accordance with the regulations of, and plans shall meet the approval of, the Chief Engineer of the Fire Department.

CHAPTER 20

Section 20.100. Chapter II of the Revised Ordinances of the City and County of Honolulu, 1923, and all other amendments thereto are hereby repealed.

Section 20.200. This Ordinance shall take effect from and after the date of its approval.

Introduced by

JOS. SYLVA,
Supervisor.

Date of Introduction:
December 18, 1928.

Approved this 13th day of September, A. D. 1929.

JOHN H. WILSON,
Mayor, City and County of Honolulu, T. H.

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