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# BUILDING CODE CITY OF BOSTON

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No changes to the 1970 Building Code  
from the 1967 Building Code.

Supplement to the 1970 Building Code

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July 1, 1970

KEVIN H. WHITE  
Mayor

RICHARD R. THUMA, JR.  
Building Commissioner



\* Gov Doc  
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# THE COMMONWEALTH OF MASSACHUSETTS

## ACTS OF 1938, CHAPTER 479

AN ACT FOR CODIFICATION, REVISION AND AMENDMENT OF THE LAWS RELATIVE TO THE CONSTRUCTION, ALTERATION AND MAINTENANCE OF BUILDINGS AND OTHER STRUCTURES IN THE CITY OF BOSTON.

### PART I.

#### ADMINISTRATION

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**Sect. 101. Title.**—This act shall be known and may be cited as the Boston Building Code and is hereinafter referred to as this code.

**Sect. 102. Repeals.**—Except as provided in section one hundred and three, the following acts and parts of acts, as severally amended, are hereby repealed;—chapter two hundred and sixty-five of the acts of eighteen hundred and ninety-seven; the two paragraphs added to section four of chapter three hundred and eighty-three of the acts of nineteen hundred and five by section one of chapter one hundred and fifty-six of the Special Acts of nineteen hundred and nineteen; chapter five hundred and fifty of the acts of nineteen hundred and seven, except section one hundred and twenty-eight thereof; chapter three hundred and forty-two of the acts of nineteen hundred and eleven; chapter seven hundred and twenty-nine of the acts of nineteen hundred and thirteen; chapter seven hundred and eighty-two of the acts of nineteen hundred and fourteen; sections one to five, inclusive of chapter one hundred and sixty-three of the Special Acts of nineteen hundred and nineteen; chapter two hundred and seventy-eight of the acts of nineteen hundred and twenty-three; chapter one hundred and eighty-two of the acts of nineteen hundred and twenty-six; and chapter forty-two of the acts of nineteen hundred and twenty-seven.

**Sect. 103. Pending Actions.**—All actions and proceedings, at law or in equity, and all prosecutions, pending on the effective date of this code, whether commenced for the purpose of enforcing any of the provisions of the acts, or parts, thereof, repealed by the preceding section or brought upon any complaint or indictment for the violation of any of such provisions, or for the violation of any ordinance, rule or regulation established thereunder for the violation of which a penalty of a fine or imprisonment, or otherwise, is provided therein, may be prosecuted and enforced to the same extent as if said acts, or parts thereof, were still in force and effect.

**Sect. 104. Other Statutes.**—All statutes applicable generally to departments of the city of Boston, including the provisions of section five of chapter four hundred and eighty-six of the acts of nineteen hundred and nine, as most recently amended by chapter two hundred and twenty-seven of the acts of nineteen hundred and thirty-four, and any pertinent action taken thereunder whether before or after the effective date of this code,

shall apply to the building department and to the boards established under sections one hundred and nine, one hundred and seventeen, one hundred and twenty and one hundred and twenty-one hereof.

**\*Sect. 105. Effective Date.**—This code shall take full effect upon its acceptance by vote of the city council of the city of Boston, subject to the provisions of its charter. If an application for a permit is filed before said effective date, and a permit is issued thereon and the work is actually commenced within ninety days after the issuance of the permit, the applicant notwithstanding any provision to the contrary in section one hundred and seven, may elect to be governed in the entire operation covered by the permit either by the building laws as they existed when the application was filed or by this code.

[\*As amended by Ord. 1943, ch. 2]

**† Sect. 105A. [Amendment by Ordinance.]**—The city of Boston, for the purposes of the prevention of fire and preservation of life, health and morals, or for any of such purposes, may from time to time, by ordinance and upon the written recommendation of the building commissioner or the board of appeal, regulate the inspection, materials, construction, alteration, repair, height, area, location and use of buildings and other structures in said city, except such buildings or structures as are excluded from the operation of this code by sub-section (a) of section one hundred and seven, and for any or all of said purposes may from time to time, by ordinance upon like written recommendation, alter, amend, extend or render ineffective any provision or provisions of this code regulating building and other structures as aforesaid.

[† As inserted by Stat. 1939, ch. 217]

**Sect. 106. Meaning of Certain Words.**—

“Approved”, approved by the building commissioner of the city of Boston.

“Commissioner”, the building commissioner of the city of Boston.

“Department”, the building department of the city of Boston.

**\*Sect. 107. Scope.**—(a) The provisions of this code shall apply to every building or structure hereafter erected in the city of Boston, except public highway, railroad or railway bridges

or trestles, quays or wharves, buildings owned and occupied by the United States or the commonwealth, railroad structures and stations used primarily for railroad purposes, subway and elevated railway structures and stations used primarily for railway purposes, voting booths erected and maintained by the board of election commissioners, prefabricated metal tanks of less than five thousand gallons capacity and tanks exceeding ten thousand gallons capacity for liquids other than water, tunnels constructed and maintained by a public authority, tents covering an area less than one hundred square feet, fences less than six feet high, signs or billboards upon the ground and signs less than one square foot in area, upon or attached to the outside of a structure and flagpoles less than twenty feet in length.

(b) The provisions of sections one hundred and eight, one hundred and fourteen, one hundred and sixteen, one hundred and eighteen, one hundred and nineteen, one hundred and twenty-two, and one hundred and twenty-three shall apply to pre-code buildings.

(c) A pre-code building may be altered, repaired, enlarged, moved, or converted to other uses, only in conformity with the following provisions of this section and subject to permit as hereinafter provided.

(d) A pre-code building which is altered or repaired within any period of twelve months, said alterations or repairs costing in excess of fifty per cent of its physical value, shall be made to conform to the requirements of this code for post-code buildings. A pre-code building damaged by fire or otherwise in excess of fifty per cent of its physical value before such damage shall be made to conform to such requirements, if repaired. If the cost of such alterations or repairs or the amount of such damage is more than twenty-five but not more than fifty per cent of the physical value of the building it shall be made to conform to such requirements in the portions so altered or repaired to such extent as the commissioner may determine. For the purposes of this paragraph physical value shall mean the reproduction cost of the building less physical deterioration as determined by the building commissioner.

(e) When occupancy of a pre-code building, or portions thereof separated from the remainder as required in part II, is so changed that the hazard is increased, the commissioner

may require that said pre-code building or said portions thereof be made to conform with the provisions of this code, which will specifically eliminate said increased hazard.

1. All buildings altered or repaired shall, in the opinion of the building commissioner, provide structural safety, adequate resistance to the spread of fire, and safe egress in the event of fire to the occupants.

2. Structural safety shall be construed to mean that a building or parts thereof shall sustain twice the loads and stresses subjected therein or thereupon by actual normal use. Owners, if directed to do so by the building commissioner, shall demonstrate such structural safety by actual load tests made as directed by him.

3. Adequate resistance to the spread of fire shall be construed to mean protection to adjacent properties and protection to egress enclosures keeping them free from fire long enough to permit the occupants to evacuate the building. The resistance of various materials and constructions to fire shall be assumed to be as stated in this code or as otherwise satisfactorily demonstrated to the commissioner.

4. Safe egresses not less than two in number shall be construed to mean egress facilities sufficient to evacuate the building in three minutes. Owners of buildings shall, if directed by the building commissioner, demonstrate the time required to evacuate the occupants by actual test conducted under the direction of the commissioner.

5. An electrical fire alarm system shall be installed, if it is necessary in the opinion of the commissioner to meet the above egress requirements.

(f) A pre-code building which is enlarged in floor area or in number of stories shall be made to conform throughout the entire building to the requirements of this code in respect to egress and fire protection.

(g) A pre-code building to which repairs and alterations are made which are not covered by the preceding paragraphs of this section, may be repaired or altered with the same kind of materials as those of which the building is constructed, providing such alterations or repairs will not increase an existing non-

conformity or hazard; but not more than twenty-five per cent of the roof covering of a building shall be replaced in any period of twelve months unless the entire roof covering is made to conform with the requirements of this code for post-code buildings. New roofing meeting the requirements of this code may be placed over existing roofing providing that it be properly supported and securely fastened.

(h) A pre-code building when moved to another location shall conform to the requirements of this code relative to the fire limits, to location on the lot and to exterior walls.

(i) Except as otherwise provided in this section, no provision of this code shall be held to deprive the health department, the police commissioner, the board of street commissioners, the licensing board, the fire commissioner or the park department of the city of Boston either of any power or authority which it, he or they had on the effective date of this act or of any remedy then existing for the enforcement of its, his or their orders.

(j) Provisions of this code relating to buildings shall also apply to structures other than buildings to such extent as they are pertinent.

[\*As amended by Ord. 1943, ch. 2]

†Sect. 108. **Maintenance.**—All buildings or structures, and all parts thereof, shall be maintained in a safe condition. All devices or safeguards which are required by this code in a building when erected, altered or repaired, shall be maintained in good working order, except as otherwise provided in section twenty-seven A of chapter one hundred and forty-eight of the General Laws. Except as otherwise provided in paragraph (d) of section one hundred and six, the owner shall be responsible for the maintenance of all buildings and structures. This section shall apply to pre-code as well as to post-code buildings.

[ † As amended by Ord. 1943, ch. 2 ]

**Sect. 109. Organization.**—(a) There is hereby established in the city of Boston a department to be called the building department, which shall be in charge of the building commissioner.

(b) The commissioner shall have had at least ten years' experience as an architect, builder or civil engineer, and shall



be appointed by the mayor for a term of five years. He shall receive such salary as shall be fixed by the city council, with the approval of the mayor.

(c) Upon the effective date of this code the building commissioner of the building department, as constituted immediately prior thereto, shall become the building commissioner of the building department established by paragraph (a) of this section, the members of the board of appeal, as constituted immediately prior thereto, shall become the members of the board of appeal established by paragraph (a) of section one hundred and seventeen, the members of the board of examiners, as constituted immediately prior thereto, shall become the members of the board of examiners established by paragraph (a) of section one hundred and twenty, and the licensed master gasfitter member of the board of examiners of gasfitters, as constituted immediately prior thereto, shall become the licensed master gasfitter member of the board of examiners of gasfitters established by paragraph (a) of section one hundred and twenty-one, and each of said persons shall thereafter hold his respective position until the expiration of such period of time as shall be equal to the remainder of the term for which he was appointed, unless sooner removed or discharged according to law; and all of the employees of the building department, as constituted immediately prior thereto, who are subject to the civil service laws shall be reappointed to similar positions in the building department or the several boards established by this code with the same status and compensation held and received by them, respectively, immediately prior thereto in the building department and the several boards established by this code, without civil service examination or registration; and the said building commissioner, and all such employees upon such reappointment, shall retain or would thereafter accrue to them, and their services shall be deemed to have been continuous to the same extent as if this code had not been passed.

(d) The commissioner, with the approval of the mayor, may appoint such number of officers, inspectors, assistants and other employees as the city council shall from time to time determine. No person shall be appointed as inspector of construction who has not had at least five years' experience as a builder, civil engineer or architect, or as a superintendent, foreman or competent mechanic in charge of construction.

(e) The commissioner may appoint as his deputy an officer or other employee in the department who shall, during the absence or disability of the commissioner, exercise all the powers of the commissioner.

(f) No officer or employee connected with the department, except one whose only connection is as a member of a board, shall be financially interested in furnishing of labor, material or appliances for the construction, alteration or maintenance of a building, or in the making of plans or of specifications therefor, unless he is the owner of such building. No such officer or employee shall engage in any work which is inconsistent with the duties or with the interests of the department. The provisions of this paragraph shall not apply to the members of boards established by this code.

(g) The commissioner shall keep a record of the business of the department. The records of the department shall be open to public inspection. The commissioner shall not, however, be required to allow inspection of the plans of buildings except upon request of the owner. If such request is made more than two months after completion of the work described in the plans, the commissioner shall allow such inspection only upon payment of such fees as the commissioner, with the approval of the major, may establish.

**\*Sect. 110. Application for Permit.**—(a) Whoever desires in the city of Boston to erect, enlarge, alter, substantially repair, move, demolish or change the occupancy of a building or structure, or to install, alter or substantially repair plumbing, gasfitting, fire extinguishing apparatus or elevators, or to install a steam boiler, furnace, heater, or other heat producing apparatus the installation of which is regulated by this code, or to install an engine or dynamo, or to cause any such work to be done, shall first make application to the building commissioner and obtain a permit therefor.

(b) Each application for a permit with the required fee shall be filed with the commissioner on a form furnished by him and shall contain a general description of the proposed work and its location. It shall be signed by the owner or his authorized agent, and before a permit is issued such application shall also be signed by the person who is to perform or take charge of the work covered by such permit.

(c) Each application hereunder shall indicate the proposed occupancy of all parts of the building and of that portion of the lot, if any, not covered by the building, and shall contain such other information as may be required by the commissioner.

(d) The commissioner may require the material facts contained in each such application to be certified by the applicant under oath.

(e) When required by the commissioner, copies of plans drawn with sufficient clarity and detail to indicate the nature and character of the work shall accompany every such application, and shall be filed in duplicate with the commissioner. Such plans shall contain information, in the form of notes or otherwise, as to the quality of materials where quality is essential to conformity with this code. Such information shall be specific, and this code shall not be cited as a whole or in part, nor shall the term "legal" or its equivalent be used, as a substitute for specific information.

(f) The commissioner may require details, computations, stress diagrams and other data necessary to describe the construction and basis of calculations. He may also require plans showing the location of the proposed building and of every existing building on the lot. He may require structural plans and computations to bear the signature of the architect or engineer in charge of the structural design, and plot plans to bear the signature of an approved surveyor.

(g) An application for a permit for any proposed work shall be deemed to have been abandoned six months after the date of filing, unless within such time a permit shall have been issued; provided, that for cause one or more extensions of time for periods of not exceeding ninety days each may be allowed in writing by the commissioner.

(h) The commissioner shall examine each application for permit and the plans and computations filed therewith and shall ascertain by examination whether the construction indicated and described is in accordance with the requirements of this code and of all other pertinent laws or ordinances.

(i) The commissioner may accept an application for a permit accompanied by plans and computations and an affidavit filed therewith by a competent architect or engineer to the effect that

said plans and computations are in accordance with the requirements of this code and of all other pertinent laws or ordinances.

[\*As amended by Ord. 1943, ch. 2]

† **Sect. 111. Permits.**—(a) If the commissioner is satisfied that the work described in an application for permit conforms to the requirements of this code and other pertinent laws and ordinances, and if the person designated by signature on the application as the person who will perform or take charge of the work is duly licensed, the commissioner shall issue a permit therefor to the applicant; provided, that if the work to be done, in the opinion of the commissioner, is of minor importance, and of such simple character that its execution by an unlicensed person will not endanger the public or any workman engaged thereon, the commissioner need not require the signature to be that of a licensed person but may issue the permit applied for after entering upon the application his reason for waiving such requirement.

(b) If the application for a permit and the plans filed therewith describe work which does not conform to the requirements of this code or other pertinent laws or ordinances, the commissioner shall not issue a permit, but shall return the plans to the applicant with his refusal to issue such permit. Such refusal when requested shall be in writing and shall contain the reasons therefor.

(c) Permits for ordinary repairs, for minor alterations not involving vital structural changes, may be issued upon presentation of an application on a special form, to be furnished by the commissioner, and payment of the required fee.

(d) When application for permit to erect or enlarge a building has been filed, and pending issuance of such permit, the commissioner may, in his discretion, upon payment of the required fee, issue a special permit for the foundations of such building. The holder of such a special permit shall proceed only at his own risk and without assurance that a permit for the superstructure will be granted.

(e) The commissioner shall act upon an application for a permit with plans as filed, or as amended, without unreasonable or unnecessary delay. A permit issued shall be construed to be a license to proceed with the work and shall not be construed as authority to violate, cancel, alter or set aside any of the pro-

visions of this code, nor shall such issuance of a permit prevent the commissioner from thereafter requiring correction of errors in plans or in construction or of violations of this code. Any permit issued shall become invalid unless the work authorized by it shall have been commenced within six months after its issuance; provided, that for cause one or more extensions of time, for periods not exceeding three months each, may be allowed in writing by the commissioner, except that in no event shall the time for commencing the work be extended beyond eighteen months after the issuance of the permit. Any permit issued may be revoked by the commissioner at any time after notice and hearing if there is a false statement or misrepresentation of a material fact in the application for the permit or in the plans or computations filed therewith, or if the work authorized by the permit violates any provision of this code or other provision of law or the permit is otherwise issued in error, or if in the course of the work there is any violation of any provision of this code or other provision of law, or if after commencement of the work there is unreasonable delay in completing the work, or if there is other good cause for revocation of the permit.

(f) When the commissioner issues a permit he shall endorse in writing, or stamp, duplicate sets of plans "Approved". One set of plans so approved shall be retained by the commissioner and the other set shall be returned to the applicant, shall be kept at the site of work and shall be open to inspection at all reasonable times by the commissioner or his authorized representative.

(g) An architect, engineer or builder who is preparing plans for a building or structure in the city of Boston may make written request of the commissioner for an interpretation of this code as specifically applicable to such building or structure. The request shall be made on a form furnished by the commissioner, shall indicate the specific provision of this code as to which interpretation is so desired, shall be accompanied by the required fee, and shall contain or be accompanied by a description of the proposed work with plans sufficient to enable the commissioner to form an opinion. The commissioner shall make reply in writing within thirty days after receipt of the request either that the description of the proposed work is inadequate to form the basis of an opinion, or that he discerns no reason

under the indicated provision of this code for disallowing the proposed construction, or that his interpretation of such provision will not allow the proposed construction for reasons which he shall state. If the commissioner shall interpret such provision as not allowing the proposed construction, such interpretation shall be deemed a disallowance thereof and any person deeming himself aggrieved thereby may appeal from such disallowance as provided in section one hundred and eighteen.

(h) Whenever a permit is to be issued in reliance upon an affidavit as provided in paragraph (i) of section one hundred and ten or whenever the work to be covered by a permit involves construction under conditions which, in the opinion of the commissioner, are hazardous or complex, the commissioner shall require that the architect or engineer who signed the affidavit or made the plans or computations shall supervise such work, be responsible for its conformity with the approved plans, and forthwith upon its completion make and file with the commissioner written affidavit that the work has been done in conformity with the approved plans and with the structural provisions of this code. In the event that such architect or engineer is not available a competent person whose qualifications are approved by the commissioner shall be employed by the owner in his stead.

[ † *As amended by Ord. 1943, ch. 2 and Ord. 1953, ch. 7* ]

‡ **Sect. 112. Fees.**—(a) Whoever applies for a permit shall pay, at the time of filing his application, the fee established under authority of chapter two hundred and ninety-seven of the acts of nineteen hundred and thirty-one as amended by Chapter 173 of the acts of nineteen hundred and thirty-nine.

(b) The commissioner, with the approval of the mayor, may establish and from time to time alter or amend fees—

(1) For producing for inspection the plans of buildings, as provided in section one hundred and nine.

(2) For issuance of a special foundation permit, as provided in paragraph (d) of section one hundred and eleven.

(3) For written interpretation of his code given for the purpose of an appeal from a disallowance as provided in paragraph (g) of said section one hundred and eleven.

(c) No fee paid in connection with an application for a permit shall be returned, whether or not the permit is granted.

[ ‡ *As amended by Ord. 1943, ch. 2*]

Note—Chapter 297 of the Acts of 1931 was affected by Stat. 1949, ch. 222, which gave to the City of Boston authority to fix certain fees and charges.

**Sect. 113. Inspection.**—(a) The commissioner shall examine each site, application for permit to erect or enlarge a building or structure upon which has been received, and shall examine all buildings, applications for permit to enlarge, alter, repair, move, demolish or change the occupancy of which has been received. He shall inspect all such buildings and structures from time to time during and finally upon the completion of their erection, enlargement, alteration, repair, moving or demolition. He shall make a record of every such examination and inspection and of all violations of this code. The publication of such records shall be privileged.

(b) No building operation requiring a permit shall be commenced until the permit holder or his authorized agent shall have posted a building permit card in a conspicuous place protected from the weather on the front of the premises and in such a position as to permit the commissioner to make the required entries thereon respecting inspection of the work. Such card shall be preserved and shall remain posted until the completion of the work.

**\*Sect. 114. Posting Floor Loads.**—No pre-code or post-code building shall be occupied for any purpose which will cause the floors thereof to be loaded beyond their safe capacity as specified in this code; provided, that the commissioner may permit occupancy of a building for mercantile, commercial or industrial purposes, by a specific business, when he is satisfied that such safe capacity will not thereby be exceeded, even though the class of occupancy of such business, under this code, requires a greater load capacity. In every such case the safe floor loads, as determined by the commissioner, shall be marked on metal plates of approved design which shall be supplied and securely affixed by the owner of the building in a conspicuous place in each story to which they relate. Such plates shall not be removed or defaced, and if lost, removed or defaced shall be replaced by such owner. No such owner shall place or permit

to be placed, or to remain on any floor of a building a greater load than the safe load so determined and posted.

[\*As amended by Ord. 1943, ch. 2]

‡ **Sect. 115. Annual Report.**—The commissioner shall annually, not later than May first, submit a report to the mayor, covering the work of the department during the preceding calendar year, and shall incorporate in said report a summary of the decisions of the board of appeal, a summary of the proceedings of the board of examiners and of the board of examiners of gas fitters, during said year, and his recommendations as to desirable amendments of this code.

[ † As amended by Ord. 1943, ch. 2 ]

‡ **Sect. 116. Powers and Duties of Building Commissioner.**—  
(a) The commissioner and the health commissioner shall severally enforce the provisions of this code relative to his powers and duties and they may, themselves or by their respective duly authorized representatives, enter any building or premises in said city to perform any duty imposed upon them, respectively, by this code.

(b) Upon notice from the commissioner that work on any building or structure is being done contrary to the provisions of this code or in a dangerous or unsafe manner, such work shall be immediately stopped. Such notice shall be in writing and given to the owner of the property, or his agent, or the licensed builder or mechanic doing the work, and shall state the conditions under which work may be resumed.

(c) Whoever hinders or prevents, or attempts to hinder or prevent, the commissioner or his authorized representative from entering a building, structure or enclosure, or part thereof, in the performance of his duty in the enforcement of any provision of this code shall be punished by a fine of not less than fifty nor more than one hundred dollars. Each day during any portion of which such hindering continues shall be considered a separate offense.

(d) Every building of which the exits are insufficient shall be provided with exits satisfactory to the commissioner; and every building which is dangerous or unsafe shall be made safe or removed; or every such building shall be vacated forthwith on order of the commissioner, with the approval of the mayor. Such



order shall be in writing and shall be addressed and delivered, or mailed, postage prepaid, to the owner or tenant, if he is known and can be found, or otherwise by posting an attested copy of the order in a conspicuous place upon an external wall of the building, and shall state the conditions under which the building may again be used or occupied. An attested copy so posted shall not be defaced or removed without the approval of the commissioner. If in the opinion of the commissioner the public safety so requires the commissioner, with the approval of the mayor, may at once enter the building or other structure which he finds unsafe or dangerous, or land on which it stands, or the abutting land or buildings, with such assistance as he may require, and make safe or remove said unsafe or dangerous building or other structure and may protect the public by a proper fence or otherwise as may be necessary, and for this purpose may close a public or private way.

\*(e) A claim for the expense incurred by the commissioner under paragraph (d) shall constitute a debt due the city upon completion of the work and rendering to the owner of an account therefor and recoverable from the owner in an action of contract. Said debt, together with interest thereon at the rate of six per cent per annum from the date upon which said debt became due, shall constitute a lien upon the real estate on which the expense was incurred in the manner hereafter provided. Such lien shall take effect upon the filing, within ninety days after the debt became due, for record in the registry of deeds for Suffolk county, or in the case of registered land with the assistant recorder for the Suffolk district, of a statement of the claim, signed by the commissioner, setting forth the amount claimed without interest. Such lien shall continue for two years from the first day of October next following the date of filing said statement. Such lien may be dissolved by filing for record in such registry of deeds or with said assistant recorder as the case may be, a certificate from the collector-treasurer that the debt for which such lien attached, together with interest and costs thereon, has been paid or legally abated. The collector-treasurer shall have the same powers and be subject to the same duties with respect to such claim as in the case of the annual taxes upon real estate; and the provisions of law relative to the collection of such annual taxes, the sale or taking of land for the non-payment thereof, and the redemption of land so sold or taken shall apply.

(f) The owner of the real estate to which a lien has attached, as provided in paragraph (e) within ninety days after the statement of said lien was filed in the registry of deeds or with said assistant recorder, as the case may be, may appeal to the municipal court of the city of Boston, which shall hear and determine after a hearing whether the amount of the claim is more than the amount actually expended to make safe or remove the building or structure, if amount is more, said court may reduce the amount of the claim to the amount so actually expended.

(g) Any requirement necessary for the strength or stability of a pre-code or proposed structure or for the safety of the occupants thereof, not specifically covered by this code, shall be determined by the commissioner subject to appeal to the board of appeal.

(h) The commissioner shall examine every building reported as dangerous or damaged, and shall make a written record of such examination, stating the nature and estimated amount of the damage, and the purpose for which the building was used, and in case of fire the probable origin thereof.

(i) The owners of buildings in Boston shall comply with, and all materials used and work performed in gas fitting in Boston shall be in accordance with, the rules and regulations from time to time in effect under the provisions of section twelve H of chapter twenty-five of the General Laws, except as such rules and regulations may be varied under the provisions of sections one hundred and seventeen, one hundred and eighteen and one hundred and nineteen of this code. The commissioner and the health commissioner of the city of Boston shall severally have power to inspect from time to time gas fixtures and appliances in any and all buildings in Boston and to compel compliance in Boston with the rules and regulations aforesaid.

(j) The commissioner shall make and issue rules and regulations governing the tearing down of buildings.

(k) The provisions of this section shall apply to pre-code as well as post-code buildings.

\*\* (1) Whoever desires to substitute for the materials or methods covered by this code, materials or methods of construction or maintenance not covered thereby, shall present to the commissioner plans, methods of analysis, and tests or other information substantiating the analysis of the system or qualities of the material and shall make such additional tests or present

satisfactory evidence of such tests as the commissioner may require. The costs of any tests required to determine acceptability of substitute materials or methods shall be paid by the applicant. When the strength of any construction cannot be satisfactorily determined by the application of accepted engineering principles, its safe strength shall be determined as one sixth of the ultimate strength evidenced by test of full size units or assemblies thereof of such construction so loaded as to produce critical stresses. Such materials or methods of construction shall not be used until after the commissioner has issued regulations fixing the practices to be followed, but no such regulation shall have the effect of altering the working stresses for any material herein mentioned or of reducing the fire-resistive and fire-protective requirements of this code; provided, that any such regulation fixing the practices to be followed in the use of any such material may reduce the fire-resistive or fire-protective requirements of this code if in promulgating such regulation the commissioner certifies, on the basis of reports on file in his office as to tests of such material made in accordance with standard specifications of the American Society for Testing Materials, that in his opinion such material used in accordance with such regulation will provide substantially as much safety from fire as material meeting such fire-resistive and fire-protective requirements.

[ ‡ *As amended by Ord. 1943, ch. 2 and ch. 737 of 1960*]

[\**As amended by ch. 234, Acts 1958*]

[\*\**As amended Ord. 1957, ch. 11*]

**\*Sect. 117. Board of Appeal.**—(a) There is hereby established in the city of Boston a board, to be called the board of appeal, and to consist of five members appointed by the mayor in the following manner:—One member from two candidates, one to be nominated by the Boston Real Estate Exchange and one by the Massachusetts Real Estate Exchange; one member from two candidates, one to be nominated by the Boston Society of Architects and one by the Boston Society of Civil Engineers; one member from three candidates, one to be nominated by the Master Builders Association, one by the Building Trades Employers' Association and one by the Building Contractors Association of Massachusetts, Inc.; one member from two candidates to be nominated by the Building Trades Council of Boston and Vicinity; and one member selected by the mayor.

(b) Upon the expiration of the term of office of a member of said board in office on the effective date of this code his

successor shall be appointed for the term of five years; and subsequent appointments to said board shall be for terms of five years each. Vacancies shall be filled for an unexpired term in the manner in which original appointments are required to be made. Each member of the board of appeal shall receive for every day or part thereof of actual service twenty dollars or such other sum as may from time to time be fixed by the city council with the approval of the mayor; but no member shall so receive in any one year more than fifteen hundred dollars or such other sum as may from time to time be fixed by the city council with the approval of the mayor. No member shall act in a case in which he has a personal interest, and when a member is so disqualified, or absent, the remaining members shall designate a substitute.

Note—Chapter 3 of the Ordinances of 1961 provides: “Each member of the board of appeal shall receive for every day or part thereof of actual service thirty-five dollars, but in no event shall any member of said board receive in any one year more than forty-two hundred dollars in the aggregate for services rendered by him under the building code and the zoning law. .” Effective January 1, 1953.

(c) Members of said board shall be residents of or engaged in business in the city of Boston.

(d) Said board shall cause to be made a detailed record of all its proceedings, which shall set forth the reasons for its decisions, the vote of each member participating therein, the absence of a member, the name of his substitute and any failure of a member to vote.

(e) The board shall establish rules and regulations for its own procedure not inconsistent with this code.

[\*As amended by Stat. 1949, ch. 201, and Stat. 1952, ch. 212]

**Sect. 118. Appeals.**—(a) A person whose application for a permit has been refused by the commissioner may appeal to said board of appeal within ninety days thereafter. A person who has been ordered by the commissioner to incur expense may so appeal therefrom within thirty days of the date of such order, except that, in case of a building or structure, which, in the

opinion of the commissioner, is unsafe or dangerous, the commissioner may in his order limit the time for such appeal to a shorter period. A person aggrieved by an adverse interpretation of this code and a disallowance by the commissioner of proposed construction thereunder, as provided in section one hundred and eleven, may so appeal from such disallowance within thirty days after the date thereof. Appeals hereunder shall be on forms provided by the commissioner and shall be accompanied by such fee as may be established by the commissioner, with the approval of the mayor.

(b) The commissioner may refer without fee to the board of appeal for its decision such cases as, in his opinion, justice requires.

† **Sect. 119. Decisions of the Board of Appeal.**—(a) The board of appeal, when so appealed to and after a hearing, may vary the application of any provision of this code to any particular case when in its opinion the enforcement thereof would do manifest injustice, provided that the decision of the board shall not conflict with the spirit of any provision of this code.

(b) Every decision of said board shall be in writing, shall indicate the vote of each member upon the decision, and if it is to vary the application of any provision of this code or modify an order of the commissioner, shall require the assent of at least four members. Every decision shall promptly be filed in the office of the commissioner, and shall be open to public inspection; a certified copy shall be sent by mail or otherwise to the appellant and a copy shall be kept publicly posted in the office of the commissioner for two weeks after filing.

(c) A decision of said board to vary the application of any provision of this code or modify an order of the commissioner shall specify in what manner such variation or modification, respectively, is made, the conditions upon which it is made and the reasons therefor.

(d) Said board shall in every case reach a decision without unreasonable or unnecessary delay.

(e) If the refusal, order or disallowance of the commissioner is reversed or modified, or the application of any provision of

this code is varied by a decision of said board, the commissioner shall immediately take action in accordance with such decision; but no decision of said board shall be regarded as establishing a precedent or be held to amend this code or the commissioner's interpretation thereof.

(f) A person aggrieved by a decision of said board, whether previously a party to the proceeding or not, or a municipal officer or board, may, within fifteen days after the filing of such decision in the office of the commissioner, bring a petition in the supreme judicial court for the county of Suffolk for a writ of certiorari to correct errors of law in such decision, and the provisions of section four of chapter two hundred and forty-nine of the General Laws shall, except as hereinbefore provided, apply to such petition.

The person filing the petition shall file a bond with sufficient surety, to be approved by the court, for such sum as shall be fixed by the court, to indemnify and save harmless the person or persons in whose favor the decision was rendered from all damages and costs which they may sustain in case the decision of said board is affirmed. In case the decision of the board is affirmed the court, on motion, shall assess damages, and execution shall issue therefor.

| † *As amended by Ord. 1943, ch. 2*]

‡**Sect. 120. Board of Examiners.**—(a) There is hereby established in the City of Boston a Board of Examiners to consist of three members appointed by the Mayor. The Board shall consist of an engineer or architect with at least five years' experience in the City of Boston, a contractor or person well qualified in the supervision of construction work with at least five years' experience in the City of Boston, and a lawyer or other person with proper legal qualifications. Said Board shall exercise the powers and perform the duty herein provided. Upon the expiration of the term of office of a member of said Board in office on the effective date of this code, his successor shall be appointed for the term of three years; and subsequent appointments to said Board shall be for terms of three years each. Vacancies shall be filled by appointments by the Mayor for the remainder of the unexpired term. Each member of the board of examiners shall receive for every day or part thereof of actual service ten dollars or such other sum as may from time to time

be fixed by the city council with the approval of the mayor; but no member shall so receive in any one year more than one thousand dollars or such other sum as may from time to time be fixed by the city council with the approval of the mayor.

Note—Section 3 of the Ordinances of 1961 provides: “Each member of the board of examiners, and the appointive member of the board of examiners of gasfitters, shall receive for every day or part thereof of actual service twenty-five dollars, but in no event more than two thousand dollars in any one year.”

(b) \*The board of examiners shall hold examinations, under rules and regulations adopted by it, of persons desiring to be registered as qualified to have charge or control of the construction, alteration, removal or tearing down of buildings or structures. Due notice of the time and place for such examinations shall be posted in the office of the building department and published in the City Record.

Note—Stat. 1945, Chap. 626, provides that the licensing of elevator and escalator mechanics shall be under the jurisdiction of the State Department of Public Safety.

(c) Said board shall establish various classes of persons to be registered, shall determine the qualifications required for each class, and after examination shall register in each class the persons found to possess the requisite qualifications therefor. The name and address of each person so found to be qualified, with the designation of the class in which he is registered, shall thereupon be certified by said board to the commissioner, who shall make a record thereof, which shall be open to public inspection.

(d) Except as otherwise provided in section one hundred and eleven, all work of erecting, enlarging, altering, repairing, moving and demolishing of buildings or structures and installing and repairing of elevators and escalators in the city of Boston shall be under the charge, control and personal supervision of a licensed builder or mechanic, qualified by education, training and experience for the performance of that duty in a manner which shall preserve the public safety and conform to this code and all other pertinent laws and ordinances.

(e) Any person who shall by affidavit, together with such other evidence as may be required by said board, show to it

that he has had charge or control of such work in the class in which he applies to be registered, and shall satisfy the board that he is qualified by education, training and experience to have charge or control of such work, may, without other examination, be registered in such class and be certified to the commissioner as a person qualified within such class.

(f) Said board, upon payment of the required fee, shall issue a license to each person so certified by it to the commissioner. Each license shall expire one year from the date of its issuance. Said board shall renew a license, upon the expiration thereof and upon payment of the required fee therefor, for the further period of one year from the date of renewal. The fees to be paid to said board for such licenses and renewals shall be as provided in chapter two hundred and ninety-seven of the acts of nineteen hundred and thirty-one, as amended by Chapter 173 of the acts of nineteen hundred and thirty-nine.

(g) Any person who is duly licensed as aforesaid shall be entitled to have charge or control of any work described in this section, in the class in which he is registered, until his license is revoked or suspended by the commissioner, upon the order of said board. No such license shall be revoked or suspended except upon proof, satisfactory to said board, or specific charges, filed with said board by the commissioner or other person, that the licensee has been careless or negligent in the performance of his duty in connection with work under his charge or control, or has caused or permitted a violation of this code in connection therewith, or that this code has been violated in connection with such work and that the licensee, being in charge of such work, knew, or, in the exercise of due diligence, should have known, of such violation. Upon learning of such carelessness, neglect of duty or violation of this code, the commissioner shall file charges with said board and prosecute them. Upon the filing thereof by the commissioner or other person, said board shall give to the licensee notice of a hearing thereon, which hearing shall be held by said board not less than seven days after date of said notice. Such notice shall be served upon the licensee either by service in hand or by registered mail, shall state the time and place of the hearing and shall contain a copy of the charges. At such hearing the licensee may be represented by counsel, and the commissioner may be assisted by a representative of the law department of the city.



(h) If, for any cause, a person licensed as herein provided shall cease to have charge or control of work described in this section before such work is finished, the work shall stop until another person duly licensed for the doing of such work has been placed in charge thereof.

(i) Whoever violates any provision of this section shall be punished by a fine of not more than fifty dollars.

[ ‡ *As amended by Stat. 1952, ch. 212 and Ord. 1943, ch. 2*]

[\**As amended by ch. 227, Acts of 1959*]

**Sect. 121. Omitted**

**Sect. 122. Penalties.**—(a) A building or structure which is erected or maintained in violation of any provision of this code shall be deemed a common nuisance without other proof thereof than proof of the unlawful construction or maintenance, and the commissioner may abate and remove it in the same manner in which boards of health may remove nuisances under sections one hundred and twenty-three to one hundred and twenty-five, inclusive, of chapter one hundred and eleven of the General Laws.

(b) Except as otherwise provided in this code, whoever violates any provision thereof, or whoever builds, alters, or maintains a structure or a part thereof in violation of any provision thereof, shall be punished by a fine of not exceeding five hundred dollars. Each day during any portion of which such violation is allowed to continue, or is permitted by the owner, shall be considered a separate offense.

**Sect. 123. Enforcement Jurisdiction.**—(a) Any court having jurisdiction in equity, or any justice thereof, may, upon the application of the city by its attorney—

(1) Restrain the construction, alteration, repair, maintenance, use or occupation of any building or structure constructed, maintained, used or occupied in violation of any provision of this code, and order its removal or abatement as a nuisance;

(2) Restrain the further construction, alteration, repair, maintenance, use or occupation of any building or structure which is unsafe or dangerous;

(3) Restrain the unlawful construction, alteration, repair, maintenance, use or occupation of any building or structure;

(4) Compel compliance with the provisions of this code;

(5) Order the removal by the owner of a building or structure unlawfully existing and authorize the commissioner, with the written approval of the mayor, in default of such removal by the owner, to remove it at the owner's expense.

(b) The municipal court of the city of Boston, concurrently with the superior court, shall have jurisdiction throughout the city of prosecutions and proceedings at law under the provisions of this code, and all other pertinent laws and ordinances.

(c) Upon the entry of any case brought under any provision of this code the court shall, at the request of either party, advance the case, so that it may be heard and determined with as little delay as possible.

**Secs. 124 to 132 inclusive — Omitted**

†**Sect. 133. Change of Occupancy.**—The occupancy of a building shall not be changed unless such building conforms or is made to conform with the requirements of this code for the group in which it is to be classified, except that the occupancy of a pre-code building may be changed as provided in section one hundred and seven.

[ † *As amended by Ord. 1943, ch. 2* ]

## PART II

## GENERAL PROVISIONS

100.0	Scope	103.0	Demolition of Buildings
101.0	Minor Alterations—Ordinary Repairs	104.0	Fee Computation
102.0	Installation of Service Equip- ment	105.0	Certificate of Use and Occu- pancy

## SECTION 100.0. SCOPE

**100.1. Continuity.**—The provisions of Part II, Article 1, are supplementary to the provisions contained in Part I, Administration, and both shall apply to the construction, alteration, repair, demolition, removal, maintenance, occupancy and use of new and existing buildings in the City of Boston.

**100.2. Building Official.**—Wherever used in this Code, the term “building official” shall mean the building commissioner of the City of Boston, or his authorized representative.

**100.3. Matters Not Provided For.**—Any requirement essential for structural, fire or sanitary safety of an existing or proposed building or structure or essential for the safety of the occupants thereof and which is not specifically covered by this Code, shall be determined by the building official.

**100.4. Continuation of Unlawful Use.**—The continuation of occupancy or use of a building or structure, or of a part thereof, contrary to the provisions of this Code, shall be deemed a violation and subject to the penalties prescribed in Part I, Section 122.

**100.5. Zoning Restrictions.**—When the provisions herein specified for structural, fire and sanitary safety are more restrictive than the zoning law, this Code shall control the erection or alteration of buildings in respect to location, use, permissible area and height; but in any case the most rigid requirements of either the building code or the zoning law shall apply whenever they may be in conflict.

## **SECTION 101.0. MINOR ALTERATIONS—ORDINARY REPAIRS**

Minor alterations or ordinary repairs to buildings may be made without application or notice to the building official as follows:

**101.1. Minor Alterations.**—For the purposes of this code, the term “minor alterations” shall mean minor changes or modifications in a building or any part thereof, excluding additions thereto, that do not in any way affect the fire or structural safety of the building. Minor alterations shall not include any of the work described or referred to in section 101.3, or any other work for which a permit is required under Part I, Section 110.

**101.2. Ordinary Repairs.**—For the purposes of this code, the term “ordinary repairs” shall mean replacements or renewal of existing work in a building, or of parts of the service equipment therein, with the same or equivalent materials or equipment parts, that are made in the ordinary course of maintenance and that do not in any way affect the fire or structural safety of the building or the safe use and operation of the service equipment therein. Ordinary repairs shall not include any of the work described or referred to in section 101.3, or any other work for which a permit is required under the provisions of Part I, Section 110.

**101.3. Work not Minor Alterations or Ordinary Repairs.**—For the purposes of this code, minor alterations or ordinary repairs shall not include the cutting away of any wall, floor, or roof construction, or any portion thereof; or the removal, cutting, or modification of any beams or structural supports; or the removal, change, or closing of any required means of egress; or the rearrangement or relocation of any parts of the building affecting loading or exit requirements, or light, heat, ventilation, or elevator requirements; nor shall minor alterations or ordinary repairs, include additions to, alterations of, or rearrangement, relocation, or removal of any standpipe or sprinkler piping, water distribution piping, house sewer, private sewer or drainage system, including leaders, or any soil, waste, or vent pipe, or any gas distribution system, or any other work affecting the fire or structural safety of the building.

## **SECTION 102.0. INSTALLATION OF SERVICE EQUIPMENT**

When the installation, extension, alteration or repair of an elevator, moving stairway, mechanical equipment, refrigerating, air conditioning or ventilating apparatus, plumbing, gas piping, electric wiring, heating system or any other equipment is specifically controlled by the provisions of this Code or the approved rules, it shall be unlawful to use such equipment until a certificate of approval has been issued therefor by the building official.

## **SECTION 103.0. DEMOLITION OF BUILDINGS**

**103.1. Service Connections.** — Before a building can be demolished or removed, the owner or agent shall notify all utilities having service connections within the building such as water, electric, gas, sewer and other connections. A permit to demolish or remove a building shall not be issued until a release is obtained from the utilities, stating that their respective service connections and appurtenant equipment, such as meters and regulators, have been removed or sealed and plugged in a safe manner.

**103.2. State Laws and Bonds.** — Before the issue of any permit for the demolition or removal of a building or structure situated at a site for which no building permit for re-use of the land has been issued, the applicant therefore shall file a bond running to the City, and with sureties satisfactory to the building official issuing such permit, in such penal sum as he shall determine to be twice the cost of leveling the lot, all as provided for by Chapter 143, Section 3, of the General Laws of the Commonwealth of Massachusetts.

**103.3. Lot Regulation.** — Whenever a building is demolished or removed, the premises shall be maintained free from all unsafe or hazardous conditions by the proper regulation of the lot, restoration of established grades and the erection of the necessary retaining walls and fences in accordance with the provisions of Article 13.

**103.4. Pest Control.** — Before a building can be demolished or removed, the owner or agent shall carry out effective measures for rodent extermination over the entire premises. The method of extermination employed shall be one in successful use locally and shall meet with the approval of the building official.

## **SECTION 104.0. FEE COMPUTATION**

For the determination of permit fees as required under Part I, Section 112, the square footage of the building or structure shall be computed as follows:

**104.1. Architectural Area of Buildings.**—The architectural area of a building is the sum of the areas of the several floors of the building, including basements, mezzanine and intermediate floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the center line of walls separating buildings.

**104.1.1. Other Areas.**—Covered walkways, open roofed-over areas that are paved, porches and similar spaces shall have the architectural area multiplied by an area factor of 0.50.

**104.1.2. Not Included.**—The architectural area does not include such features as pipe trenches, exterior terraces or steps, chimneys, roof overhangs, etc.

**104.2. Cost Computation.**—When required, the current edition of Building Construction Cost Data published by Robert Snow Means Company, Inc. may be used as a guide in establishing the cost of a building or structure.

**104.2.1. Costs Excluded.**—Exclude all architectural and engineering fees, cost of land, paving, walks, landscaping, movable furnishings and equipment.

## **SECTION 105.0. CERTIFICATE OF USE AND OCCUPANCY**

**105.1. New Buildings.**—No building hereafter erected shall be used or occupied in whole or in part until the certificate of use and occupancy shall have been issued by the building official.

**105.2. Buildings Hereafter Altered.**—No building hereafter enlarged, extended or altered to change from one use group to another, in whole or in part, and no building hereafter altered for which a certificate of use and occupancy has not been heretofore issued, shall be occupied or used until the certificate shall have been issued by the building official, certifying that the work has been completed in accordance with the provisions of the approved permit; except that any use or occupancy, which was not discontinued during the work of alteration, shall be discontinued within thirty (30) days after the completion of the alteration unless the required certificate is secured from the building official.

**105.3. Existing Buildings.**— Upon written request from the owner of an existing building, the building official shall issue a certificate of use and occupancy, provided there are no violations of law or orders of the building official pending, and it is established after inspection and investigation that the alleged use of the building has heretofore existed. Nothing in this Code shall require the removal, alteration or abandonment of, or prevent the continuance of the use and occupancy of a lawfully existing building, unless such use is deemed to endanger public safety and welfare.

**105.4. Changes in Use and Occupancy.**— After a change of use has been made in a building, the reestablishment of a prior use that would not have been legal in a new building of the same type of construction is prohibited unless all the applicable provisions of this Code are complied with. A change from one prohibited use, for which a permit has been granted, to another prohibited use shall be deemed a violation of this Code.

**105.5. Temporary Occupancy.**— Upon the request of a holder of a permit, the building official may issue a temporary certificate of occupancy for a building or structure, or part thereof, before the entire work covered by the permit shall have been completed, provided such portion or portions may be occupied safely prior to full completion of the building without endangering life or public welfare.

**105.6. Contents of Certificate.**— When a building or structure is entitled thereto, the building official shall issue a certificate of use and occupancy within ten (10) days after written application. The certificate shall certify compliance with the provisions of this Code and the purpose for which the building or structure may be used in its several parts. The certificate of use and occupancy shall specify: the use group, in accordance with the provision of article 2, the fire grading as defined in article 2 and table 9-4, the maximum live load on all floors as prescribed in article 7, the occupancy load in the building and all parts thereof as defined in article 2 and article 6, and any special stipulations and conditions of the building permit.





## DEFINITIONS AND CLASSIFICATIONS

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### SECTION 200.0. SCOPE

The provisions of this article shall control the classification of all buildings as to occupancy group and type of construction; and the definition of all terms relating thereto in the City of Boston, Massachusetts.

**200.1. Application of Terms.**—The terms herein defined shall be used to interpret all the applicable provisions of this code.

**200.2. Application of Other Laws.**—Nothing herein contained shall be deemed to nullify any provisions of the zoning law or any other statute of the City of Boston, Massachusetts pertaining to the location, occupancy or type of construction of buildings, except as may be specifically required by the provisions of this code.

## SECTION 201.0. DEFINITIONS

Unless otherwise expressly stated, the following terms shall, for the purpose of this code, have the meaning indicated in this section.

**201.1. Tense, Gender and Number.** — Words used in the present tense include the future; words used in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural the singular.

**201.2. Terms Not Defined.** — Where terms are not defined, they shall have their ordinarily accepted meanings or such as the context may imply.

**abut.** Touch, be contiguous. A building abuts upon a street when some part of the building touches or extends to the street line. A building shall be construed to abut upon a street if it is nearer at any point than ten (10) feet from the street line or when the space between the building and the street line is used wholly or chiefly for the purposes of a street or sidewalk.

**accepted engineering practice.** That which conforms to accepted principles, tests or standards as specifically cited in the reference standards of this code.

**accessory building.** A structure devoted exclusively to an occupancy accessory to a main occupancy of the lot.

**accessory occupancy. (accessory use).** An occupancy customarily incident to, and on the same lot as, a main occupancy.

**access stair.** A stair between two (2) floors, which does not serve as a required means of egress.

**addition.** An alteration which is an extension or increase in floor area or height of a building that increases its exterior dimensions.

**air conditioning.** The process by which the temperature, humidity, movement, cleanliness, and odor of air circulated through a space is controlled.

**air duct.** A tube or conduit, or an enclosed space or corridor within a wall or structure used for conveying air.

- airplane hangar, private.** A hangar for the storage of four (4) or less single engine planes and in which no volatile or flammable oil is handled, stored or kept other than that contained in the fuel storage tank of the plane.
- public.** A building for the storage, care or repair of private or commercial airplanes not included in the term private airplane hangar.
- aisle.** A clear and unobstructed passageway through a room.
- alley.** A secondary thoroughfare less than thirty (30) feet in width dedicated or deeded for the public use of vehicles and/or pedestrians affording access to abutting property.
- alteration.** As applied to a building or structure or service equipment thereof means a change or rearrangement in the structural parts or in the exitway facilities; or an addition, whether by extending on a side or increasing in height; or the moving from one (1) location or position to another; or any change or modification in construction or occupancy.
- apartment.** A room or suite of rooms occupied by one (1) person or one (1) family for living and sleeping purposes.
- apartment hotel.** A building primarily for persons who have their residence therein, containing four (4) or more apartments which do not have kitchens.
- apartment house.** Any building, or portion thereof, which is designed, built, rented, leased, let or hired out to be occupied, or which is occupied as the home or residence of more than two (2) families living independently of each other and doing their own cooking in the said building, and shall include flats and apartments.
- approved.** Approved by the Building Official.
- approved (rules).** The legally adopted rule of the Building Official (or of a cited reference standard).
- appurtenant structure.** A device or structure attached to the exterior or erected on the roof of a building designed to support service equipment or used in connection therewith, or for advertising or display purposes, or other similar uses.
- architect.** A person registered by the Commonwealth of Massachusetts to practice the profession of architecture.

**architectural terra cotta.** Plain or ornamental hard-burned plastic clay units normally larger in size than brick, with glazed or unglazed ceramic finish.

**area (building).** The maximum horizontal projected area of the building at or above grade, including all extensions.

**area of refuge.** A floor area to which egress is made through an exitway.

**area (surface measurement).** See "Floor Area (Gross)".

**areaway.** A space below grade, adjacent to a building, open to the outer air and enclosed by walls.

**ashlar facing.** Facing of solid rectangular units larger in size than brick, burned clay or shale natural or cast stone, with sawed, dressed and squared beds and mortar joints.

**ashlar masonry.** Masonry composed of bonded, rectangular units, larger in size than brick, with sawed, dressed or squared beds and mortar joints.

**assembly (assembly space).** Any part of a place of assembly, exclusive of a stage, that is occupied by numbers of persons during the major period of occupancy. Every balcony tier of seating shall be considered a separate assembly space.

**assembly hall.** A hall or room, including the balconies thereof, if any, in which persons may assemble in a manner as permitted in occupancy group F.

**attic.** Finished or unfinished story situated within a sloping roof, the area of which at a height of four (4) feet above the level of its finished floor does not exceed two-thirds ( $2/3$ ) of the area of the story immediately below it. There shall be only one (1) attic in any building, and it shall be considered as a half story.

— **habitable attic.** A habitable attic is an attic which has a stairway as a means of access and egress and in which the ceiling area at a height of seven and one-third ( $7-1/3$ ) feet above the attic floor is not more than one-third ( $1/3$ ) the area of the floor next below.

**automatic.** As applied to an opening protective, shall mean a door, window, damper, or other device, and its assembly, which is normally open and is designed to close automatically

when subjected to a predetermined temperature, rate of temperature rise, or abnormal smoke condition.

**automatic collapsible revolving door.** A door which is designed, supported and constructed so that the wings will release and fold back in the direction of egress under pressure exerted by persons under panic conditions, providing a legal passageway on both sides of the door pivot.

**automatic dry pipe sprinkler system.** A sprinkler system in which the piping up to the sprinkler heads is filled with compressed air, with the water supply controlled by a dry pipe valve.

**automatic dry standpipe system.** A standpipe system in which all piping is filled with compressed air. Water enters the system through a control valve actuated either automatically by the reduction of air pressure within the system or by the manual activation of a remote control located at each hose station.

**automatic fire alarm system.** A system which automatically detects a fire condition and actuates a fire alarm signal device audible to the public into a central signal system service center.

**automatic fire door.** A fire door equipped with a heat actuated closing device which will operate at a predetermined temperature of not more than one hundred and sixty-five (165) degrees F. or equipped with a rate of rise of temperature operating device.

**automatic fire pump.** A pump that maintains a required water pressure in a fire extinguishing system and which is actuated by a starting device adjusted to cause the pump to operate when the pressure in the system drops below a predetermined pressure, and to stop the pump when the pressure is restored.

**automatic sprinkler head.** A device connected to a water supply system that opens automatically at a predetermined fixed temperature and disperses a stream or spray of water.

**automatic sprinkler system.** A system of piping supplied with water under pressure with devices for releasing under the influence of heat and spraying the water on ceilings, walls and floors.

**automatic water supply source.** Water supplied through a gravity or pressure tank, or automatically operated fire pumps, or from a direct connection to an approved city water main.

**automatic wet pipe sprinkler system.** A sprinkler system in which all piping and sprinkler heads are at all times filled with water under pressure, which is immediately discharged when a sprinkler head operates, with the water continuing to flow until the system is shut off.

**automotive lift.** See "Special Hoisting and Conveying Equipment."

**backup.** That part of a masonry wall behind the facing.

**balcony.** Within an auditorium, is a floor, inclined, stepped, or level, above the main floor, the open side or sides of which shall be protected by a rail or railings. Where a balcony of an auditorium has means of egress at two (2) or more levels opening into separate foyers, one above another, each portion thereof served by such a foyer shall be considered a separate balcony for the purpose of this code.

**balloon frame.** Light timber construction in which the exterior walls consist of studs that are either continuous through floors or interrupted only by thickness of plates.

**basement.** A portion of a building below the first story.

**bay.** (Part of a structure). The space between two (2) adjacent piers or mullions or between two (2) adjacent lines of columns.

**bay window.** A window projecting beyond the wall line of the building and extending down to the foundations.

**bearing.** (See Bearing Wall.)

**block.** The lot or lots fronting on the same side of the street between two (2) streets intersecting such street on such side with no other such intersecting street intervening.

**board of appeal.** The board of appeal in the building department of the City of Boston.

**boarder. (roomer, lodger).** An individual not within the second degree of kindred to the person conducting the boarding

house living within a household who pays a consideration for such residence and does not occupy such space as an incident of employment therein.

**boarding house.** Any dwelling (other than a hotel, motel, apartment hotel, dormitory, fraternity or sorority house) in which board is provided to five (5) or more persons who are not within the second degree of kinship.

**breezeway.** A structure open to the outdoors consisting of a roof, roof supports, and floor, connecting a garage or other accessory building with a dwelling.

**brick.** A masonry unit, not less than seventy-five (75) per cent solid, having a shape approximating a rectangular prism, made from burned clay or shale, or mixture thereof. Brick may be composed of other materials when so designated, as for example, "concrete brick" and "sand-lime brick."

**building.** A structure forming a shelter for persons, animals or property and having a roof, exclusive, however, of such frameworks and tents as are customarily used exclusively for outdoor carnivals, lawn parties, or like activities. Where the context allows, the word "building" shall be construed as though followed by the words "or part thereof."

**building commissioner.** The building commissioner of the City of Boston.

**building line.** The line established by law, beyond which a building shall not extend, except as specifically provided by law.

**building official.** The building commissioner in the department of building inspection of the City of Boston, or his duly authorized representative.

**building, post-code.** A building erected after the effective date of this code and subject to the provisions thereof.

**building, pre-code.** A building already erected on the effective date of this code, or thereafter erected, under permit for its construction subject to the provisions of law in effect prior to such effective date.

**building section.** A room, floor, group of floors, wing, or any other portion of a building contained within type A fire divisions.

**building service equipment.** The mechanical, electrical, and elevator equipment, including piping, wiring, fixtures and other accessories, which provide sanitation, lighting, heating, ventilation, fire-fighting and transportation facilities essential for the habitable occupancy of the building or structure for its designated use and occupancy.

**building site.** The area occupied by a building or structure, including the yards and courts required for light and ventilation, and such areas that are prescribed for access to the street.

**bulkhead.** The raised portion of a floor or roof, raised for the passage of persons, materials, light or air, through the side of such raised portion, or for other purposes.

**buttress.** A projecting part of a wall integrated therewith to furnish lateral stability.

**casing-off.** The elimination of the frictional forces between a portion of a pile and the surrounding soil by use of a sleeve between the pile and the soil.

**cellar.** See Basement.

**central station system.** An automatic sprinkler or fire alarm system in which all equipment is supervised by a central or proprietary station to which all alarm signals are transmitted and relayed to the fire department.

**certificate of use and occupancy.** The certificate issued by the building official which permits the use of a building in accordance with the approved plans and specifications and which certifies compliance with the provisions of law for the use and occupancy of the building in its several parts together with any special stipulations or conditions of the building permit.

**change of occupancy.** A change in the occupancy group of a building heretofore existing to a new occupancy group which imposes other special provisions of law governing building construction, equipment, exitways or zoning.

**charging chute (incinerator).** An enclosed vertical passage through which refuse is fed to an incinerator.



- charging gate (incinerator).** A gate in an incinerator used to control the flow of combustion gases into the charging chute and the entry of refuse into the combustion chamber.
- chimney.** A vertical shaft of masonry, reinforced concrete, or other approved noncombustible, heat resisting material enclosing one (1) or more flues, for the purpose of removing products of combustion from solid, liquid, or gas fuel.
- chimney connector.** A pipe or metal breeching that connects combustion equipment to a chimney.
- city.** The City of Boston, Massachusetts.
- clay masonry unit.** A building unit composed of burned clay, shale, fireclay or mixtures thereof.
- clinic.** A place for the medical or similar examination and treatment of persons as out patients.
- coatings, fire-retardant.** A material applied to the surface of a building material to reduce its flame spread.
- code.** This code, the Boston Building Code, consisting of this act and the regulations established thereunder.
- collecting safe area.** A safe area that receives occupants from the assembly space it serves, as well as from other safe areas.
- combustible material.** A material which cannot be classified as noncombustible in accordance with that definition.
- concentrated load.** A conventional representation of an element of dead or live load whereby the entire load is assumed to act at a point.
- concrete.** A mixture of cement, aggregates and water, of such proportions and manipulation as to meet specific requirements.
- concrete masonry unit.** A building unit or block made of cement and suitable aggregates.
- concurrent loads.** Two (2) or more elements of dead or live load that, for purposes of design, are considered to act simultaneously.
- conflagration hazard.** The fire risk involved in the spread of fire by exterior exposure to and from adjoining buildings and structures.

**construction.** Any or all work or operations necessary or incidental to the erection, demolition, assembling, installing, or equipping of buildings, or any alterations and operations incidental thereto. The term "construction" shall include land clearing, grading, excavating, and filling. It shall also mean the finished product of any such work or operations.

**construction classification (type).** The category in which a building or space is classified by the provisions of Article 2 based on the fireresistance ratings of its construction elements.

**construction equipment.** The construction machinery, tools, derricks, hoists, scaffolds, platforms, runways, ladders and all material handling equipment safeguards and protective devices used in construction operations.

**contractor.** A person undertaking construction.

**controlled construction.** The construction of a building or structure or a specific part thereof which has been designed and erected under the supervision of a registered engineer or architect using controlled materials as herein defined in compliance with the provisions of the code.

**controlled materials.** Materials which are certified by an approved authoritative agency as meeting standards for quality and as provided in sections 722 and 800 and the reference standards.

**conveyors.** See Special Hoisting and Conveying Equipment.

**corridor.** An enclosed passage or passageway contributing to the means of egress from rooms or spaces.

**court.** An open, uncovered unoccupied space partially or wholly surrounded by the walls of a structure.

— **enclosed or inner.** A court surrounded on all sides by the exterior walls of a structure or by such walls and an interior lot line.

— **outer court.** A court having at least one (1) side thereof opening on to a street, alley, or yard or other permanent open space.

**cross over aisle.** An aisle in a place of assembly usually parallel to rows of seats, connecting other aisles or an aisle and an exitway.

**curb level.** The elevation of the street curb as established in accordance with law.

**dead end egress.** A portion of a corridor in which the means of egress is in one (1) direction only.

**dead load.** See Loads.

**deluge sprinkler system.** An open head sprinkler system without water in the system piping, with the water supply controlled by an automatic valve operated by smoke or heat-responsive devices installed throughout the sprinklered area, and independent of the sprinkler heads.

**demolition.** The dismantling or razing of all or part of a building, including all operations incidental thereto.

**department.** The department of building inspection of the City of Boston.

**door, wood, solid core bonded.** Shall be a door conforming to Architectural Woodwork Institute, 1966 edition, 2nd revision, designation "A" with surface treatment complying with the applicable requirements of section 922. An approved marking and/or certification meeting the approval of the building official shall be affixed thereon.

**dormitory.** Any dwelling (other than a fraternity or sorority house) occupied primarily as a place of temporary abode by persons attending educational institutions.

**draft hood.** A device placed in and made part of a chimney, vent connector, or combustion equipment, to (1) insure the ready escape of the products of combustion in the event of no draft, back-draft, or stoppage beyond the draft hood, (2) prevent a back-draft from entering the equipment, or (3) neutralize the effect of excessive stack action of the chimney flue upon the operation of the equipment.

**draft regulator.** A device which functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value.

**dry pipe system.** A system employing automatic sprinklers attached to a piping system containing air under pressure, the release of which as from the opening of sprinklers permits the water pressure to open a valve known as a "dry-pipe

valve.” The water then flows into the piping system and out the opened sprinklers.

**duct.** A tube, pipe, conduit, shaft or continuous enclosed passageway used for the conveying of air, gases or vapors.

**dumbwaiter.** See section 1601.

**dwelling.** A building or structure used in whole or in part for human habitation.

— **dwelling, detached.** A dwelling which is designed to be and is substantially separate from any other structure or structures except accessory buildings.

— **dwelling, multi-family.** A building containing three (3) or more dwelling units, but not including a motel.

— **dwelling, semi-detached.** A dwelling having a party wall in common with another dwelling but which otherwise is designed to be and is substantially separate from any other structure or structures except accessory buildings.

— **dwelling unit.** A room or group of rooms forming a habitable unit for one (1) family with facilities used or intended to be used for living, sleeping, cooking and eating.

**egress.** See “Means of Egress.”

**electrical.** See Form FPR 11 Massachusetts Electrical Code for all definitions of electrical equipment.

**elevator.** See section 1601.

— **freight elevator.** See section 1601.

— **hand elevator.** See section 1601.

— **hydraulic elevator.** See section 1601.

— **passenger elevator.** See section 1601.

— **power elevator.** See section 1601.

— **sidewalk elevator.** See section 1601.

**elevator repairs.** All work necessary to maintain present elevator equipment in a safe and serviceable condition and to adjust or replace defective, broken or worn parts, with parts made of equivalent material, strength and design, and only where the replacing part performs the same function as the replaced part.

- engineer.** A person registered by the Commonwealth of Massachusetts to practice the profession of engineering.
- equivalent uniform load.** A conventional representation of an element of dead or live load, used for the purposes of design in lieu of the actual dead or live load.
- erect.** To construct or reconstruct or excavate, fill, drain, or conduct physical operations of any kind in preparation for or in pursuance of construction or reconstruction, or to move a building or structure.
- escalator.** A power driven, inclined, continuous stairway used for raising or lowering passengers. (See section 1601.)
- existing building.** A building erected prior to the adoption of this code, or one for which a legal building permit has been issued.
- existing equipment.** Any equipment covered by this article which was installed prior to the effective date of this code or for which an application for permit to install was filed with the building official prior thereto.
- exit.** See "Exitway."
- exitway.** That portion of a means of egress which is separated from the area of the building from which escape is to be made by walls, floors, doors, or other means which provide the protected path necessary for the occupants to proceed with reasonable safety to the exterior of the building.
- exitway access.** That portion of a means of egress which leads to an entrance to an exitway.
- exitway discharge.** That portion of a means of egress between the termination of the exitway at the exterior of the building and ground level.
- exitway discharge court.** An exterior unoccupied space which is open to the sky for its entire area, located on the same lot with a theatre or other assembly building which it serves exclusively as an unobstructed path to the street or other public space from an exitway discharge.
- extend.** To increase in area or volume.
- exterior separation.** The shortest distance across an unobstructed outdoor space measured from the furthest projection of the

exterior wall of a building to an interior lot line or to a line halfway between the wall and that of any other building on the same lot, or to the centerline of an adjacent street or other public space.

**family.** One (1) or more persons occupying a dwelling unit and living as a single, non-profit housekeeping unit; provided that a group of five (5) or more persons who are not within the second degree of kinship shall not be deemed to constitute a family.

**fire area.** A floor area enclosed by Type A fire division and/or exterior walls.

**fire canopy.** A solid horizontal projection, extending beyond the exterior face of a building wall, located over a wall opening so as to retard the spread of fire through openings from one story to another.

**fire damper.** An approved automatic or self-closing noncombustible barrier designed to prevent the passage of air, gases, smoke or fire through an opening, a duct or plenum chamber.

**fire districts.** The territories defined and limited by the provisions of this code for the restriction of types of construction.

**fire division.** A vertical, horizontal or other construction that segregates a building or buildings into completely separate areas, spaces, parts or sections.

– **Type A, fire division.** One having a fire resistance rating and structural stability under fire conditions to provide a fire barrier between adjoining buildings or between adjoining or superimposed fire areas or building sections within the same building.

– **Type B, fire division.** (Fire separation). One having a fire-resistance rating to provide a fire barrier between adjoining rooms or spaces within a building, building section or fire area.

**fire door.** A self-closing door and its assembly, including frame, trim, hardware, so constructed and assembled in place as to retard the passage of fire.

**fire extinguisher.** A portable device the contents of which are used for extinguishing a fire.

**fire grading.** The posted fire hazard classification of a building or structure in hours or fractions of an hour as established for its occupancy group in section 902.4, tables 9-1 and 9-2.

**fire hazard.** The potential degree of fire severity existing in the use and occupancy of a building and classified as high, moderate, or low.

— **high.** All occupancies which involve the storage, sale, manufacture or processing of highly combustible, volatile flammable or explosive products which are likely to burn with extreme rapidity or produce large volumes of smoke, poisonous fumes, gases or explosions in the event of fire.

— **moderate.** All occupancies which involve the storage, sale, manufacture or processing of materials which are likely to burn with moderate rapidity and a considerable volume of smoke, but which do not produce either poisonous fumes or explosions in the event of fire.

— **low.** All occupancies which involve the storage, sale or manufacture of materials that do not ordinarily burn rapidly, nor produce excessive smoke, poisonous fumes, or explosions in the event of fire.

**fire prevention.** The preventive measures which provide for the safe conduct and operation of hazardous processes, storage of highly combustible and flammable materials, conduct of fire drills, and the maintenance of fire detecting and fire-extinguishing service equipment and good housekeeping conditions.

**fire protection.** The provisions of safeguards in construction and of egress facilities; and the installation of fire alarm, fire-detecting and fire-extinguishing service equipment to reduce the fire risk and the conflagration hazard.

**fire protection rating.** The time in hours or fractions thereof that an opening protective and its assembly will withstand fire exposure as determined by a fire test conducted in compliance with reference standards or as determined by approved extension or approved interpretation of information derived therefrom.

**fireresistance.** That property of materials or their assemblies which prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

**fireresistance rating.** The time in hours or fractions thereof that materials or their assemblies will withstand fire exposure as determined by a fire test conducted in compliance with reference standards or as determined by approved extension or approved interpretation of information derived therefrom.

**fireresistive partition.** A partition other than a fire partition which is required to subdivide the floor area of a fireresistive building for the purpose of restricting the spread of fire.

**fireretardant lumber.** Wood so treated by a recognized impregnation process as to reduce its combustibility to limits set by reference standards noted in this code.

**fire safety.** The measure of protection of a building or structure against interior and exposure fire hazards through fire-resistive construction and the provision of safe exitways and fire-detecting and extinguishing equipment.

**fire separation (material).** See Fire Division.

**fire wall.** A vertical Type A Fire Division in the form of a wall.

**fire window.** An opening protective in the form of a window and its assembly.

**flammable.** Capable of being easily ignited when exposed to flame, and which burns intensely, or has a rapid rate of flamespread.

**flame resistance.** The property of materials or combinations of component materials which restricts the spread of flame as determined by the flame resistance tests specified in this code.

**flame spread.** The propagation of flame over a surface.

**flame spread rating.** The measurement of flame spread on the surface of materials or their assemblies as determined by tests conducted in compliance with approved reference standards noted in this code.

**floor area (gross).** For zoning purposes the sum of the areas of the several floors of the structure as measured by the exterior faces of the walls, including fully enclosed porches and the like as measured by the exterior limits thereof, but excluding (a) areas used for accessory garage purposes, (b)



basement and cellar areas devoted to uses accessory to the operation of the structure, and (c) areas elsewhere in the structure devoted to housing mechanical equipment customarily located in the basement or cellar such as heating and air conditioning equipment, plumbing, electrical equipment, laundry facilities, and storage facilities.

**floor area (gross).** For the purposes of classification of occupancy, gross floor area shall be the projected horizontal area enclosed inside of walls, partitions or other enclosing construction of the building or part thereof under consideration with no deductions for hallways, stairs, closets, thickness of walls, columns or other features. When the term area is used elsewhere in this code, it shall be understood to be gross area unless otherwise specified.

**floor area (net).** The horizontal occupiable area within the space, excluding the thickness of walls, and partitions, columns, furred-in spaces, equipment, and accessory spaces such as closets, machine and equipment rooms, toilets, stairs, halls, corridors, elevators and similar unoccupied spaces.

**floor area ratio.** The ratio of gross floor area, as defined for zoning purposes, of a structure to the total area of the lot.

**floor fill.** The fill between the structural floor arch or slab and the finished flooring.

**floor finish.** The finish placed on top of the floor arch, slab or other structural floor element.

**flue.** An enclosed passageway in a chimney to carry products of combustion to the outer air.

**formed steel construction.** That type of construction used in floor and roof systems consisting of integrated units of sheet or strip steel plates which are shaped into parallel steel ribs or beams with a continuous connecting flange deck; generally attached to and supported on the primary or secondary members of a structural steel or reinforced concrete frame.

**foundation (building).** A construction that transfers building loads to the supporting soil.

**foundation pier.** A foundation element consisting of a column embedded into the soil below the lowest floor to the top of a footing or pile cap. Where a pier bears directly on the

soil without intermediate footings or pile caps, the entire length of the column below the lowest floor level shall be considered as a foundation pier. Foundation piers shall be limited to piers so constructed that the entire surface of the sides of the pier and the bearing material under the lower end of the pier can be visually inspected prior to or during construction, but which will be concealed in the final work. Piers below the lowest floor or basement level that will be exposed and open to inspection in the final work shall be considered as columns. Types of construction wherein the sides cannot be visually inspected shall be considered as piling or caissons.

**foundation wall.** A wall extending below grade.

**foyer.** A foyer, lobby, corridor or passageway, one (1) or more in combination, adjacent to the auditorium of a theatre or assembly hall at the level of the main floor or a balcony thereof and into which one (1) or more exitways therefrom open, in the path of normal egress from the building.

**frame construction.** See section 218.0.

**front.** A building or wall fronts upon a street when a wall of the building or the wall faces the street and is parallel thereto or makes an angle of less than forty-five (45) degrees therewith.

**frontage.** As applied to building location on a lot, shall mean the distance between lines drawn through the most remote points of the building perimeter, projected at right angles to a street; or an open space outside of a building, not less than thirty (30) feet in any dimension, that is accessible from a street by a driveway, lane, or alley at least twenty (20) feet in width, and that is permanently maintained free of all obstructions that might interfere with its use by the fire department.

**fuel oil.** A liquid mixture or compound derived from petroleum which does not emit flammable vapor below a temperature of one hundred and twenty-five (125) degrees F. in a Tag closed-cup tester.

**garage, private.** A building or enclosed space used for the parking or storage of not more than four (4) motor vehicles having fuel storage tanks of twenty (20) gallon capacity or

less and in which no repair, body work, or painting of vehicles is conducted, and in which no gasoline, oil, or similar products are dispensed.

**garage, public.** A building or structure for the storage, parking, care or repair of five (5) or more motor vehicles not included in the term garage private. Public garages shall be classified according to their specific use in one of the following groups:

—**group 1.** Buildings or spaces used for the parking of vehicles having fuel storage tanks in excess of twenty (20) gallon capacity; or used for the parking of vehicles of any size, and in which mechanical repair, body work, or painting of vehicles is conducted, or in which gasoline, oil, or similar products are dispensed. Group 1 public garages shall be classified in storage occupancy group B-1.

—**group 2.** Buildings or spaces used exclusively for the parking of vehicles having fuel storage tanks of twenty (20) gallon capacity or less, and in which no repair, body work or painting of vehicles is conducted, and in which no gasoline, oil, or similar products are dispensed. Group 2 public garages shall be classified in storage occupancy group B-2.

**grade.** An elevation with reference to Boston city base, namely, a horizontal plane of reference established and used by the City of Boston. The reference is the Mean Low Water at the U.S. Navy Yard in Charlestown, Boston, Massachusetts.

**grade (building height).** In cases where all walls of the principal building are more than five (5) feet from the nearest street line, the mean elevation of the ground adjoining the building on all sides; and in all other cases, the mean elevation of the nearest sidewalk.

**habitable room.** A room or enclosed floor space arranged for living, eating, or sleeping purposes (not including bathrooms, water closet compartments, laundries, pantries, foyers, hallways and other accessory floor spaces) which has a clear height from finished floor to finished ceiling of not less than seven and one-half (7-1/2) feet, except that in attics and top half-stories the height shall be not less than one-third (1/3) the area of the floor when used for sleeping, study or similar activity; and has a minimum dimension of seven (7) feet and a minimum area of seventy (70) square feet, between enclosing walls or partitions, exclusive of closet and storage spaces.

**height, building.** The vertical distance of the highest point of the roof, excluding penthouses and roof structures, above the mean grade of the sidewalk at the line of the street or streets on which the building abuts, or, in the case of a building not abutting on a street, above the mean grade of the ground between the building and whichever of the following is nearer, namely, a line twenty (20) feet from the building or the lot line; but in no event shall the mean grade of such ground be taken to be more than five (5) feet above or below the mean grade of the ground immediately contiguous to the building.

—**story.** The vertical distance from top to top of two (2) successive tiers of beams or finished floor surfaces; and, for the topmost story, from the top of the floor finish to the top of the ceiling joists, or, where there is no ceiling, to the top of the roof rafters.

—**story, first.** The lowest story of which sixty-five (65) per cent or more of the height is above the mean grade from which the height of the building is measured.

—**wall.** The vertical distance from the mean elevation of the ground adjoining the wall on all sides.

**hereafter.** After the time that this code becomes effective.

**heretofore.** Before the time that this code became effective.

**high pressure boiler.** A closed vessel in which steam or other vapor to be used externally to itself, is generated at a pressure of more than fifteen (15) pounds per square inch gage by the direct application of heat.

**hollow masonry unit.** A masonry unit whose net cross-sectional area in any plane parallel to the bearing surface is less than seventy-five (75) per cent of its gross cross-sectional area measured in the same plane.

**hood.** A canopy or similar device connected to a duct for the removal of heat, fumes or gases.

**hotel.** A building (other than a dormitory) containing four (4) or more apartments without kitchens, or containing sleeping accommodations for ten (10) or more persons, primarily the temporary abode of persons who have their residences elsewhere.

**impact load.** See “Loads”

**incombustible materials.** Synonymous with “Noncombustible Material.”

**independent.** In reference to two (2) or more exitways, removed or distant from one another in such manner that a person in any place served by such exitways may choose either of two (2) directions in a path toward an exitway and in such manner that a single fire could not, in its early stages, block both paths toward an exitway.

**industrial lift.** See “Special Hoisting and Conveying Equipment”.

**inflammable.** Synonymous with flammable.

**inner court.** See “Court.”

**interior lot line.** Any lot line other than one adjoining a street or public space.

**kitchen.** A room used or adapted for cooking and containing a stove, range, hot-plate or other cooking apparatus, which burns coal, oil, gas or other fuel or is heated by electricity, except electric appliances consuming less than eighteen hundred (1800) watts.

**lagging (pile).** Pieces of timber or other material attached to the sides of piles to increase resistance to penetration through soil.

**light gage steel construction.** That type of construction in which the structural frame consists of studs, floor joists, arch ribs, rafters, steel decks and other structural elements which are composed and fabricated of cold-formed sheets.

**live load.** See “Loads”.

**load.**

— **dead load.** The weight of all permanent construction including walls, floors, roofs, partitions, stairways and of fixed service equipment.

— **impact load.** The load resulting from moving machinery, elevators, craneways, vehicles, and other similar forces and kinetic loads.

- lateral soil load.** The lateral pressure in pounds per square foot due to the weight of the adjacent soil, including due allowance for hydrostatic pressure.
- live load.** The weight superimposed by the use and occupancy of the building, including snow load, not including the wind load, or dead load.
- wind load.** The lateral pressure on the building or structure in pounds per square foot due to wind blowing in any direction.

**load-bearing.** See “Bearing”.

**loading ramp.** A hinged, non-portable device, either mechanical or hydraulic, hand or power operated, used for spanning gaps or adjusting heights between loading surface and carrier or between loading surface and loading surface.

**lobby.** The enclosed vestibule between the principal entrance to the building and the doors to the main floor of the auditorium or assembly room of a theatre or place of assembly or to the main floor corridor of a business building.

**lodging house.** Any dwelling (other than a boarding house, dormitory, fraternity, sorority house, hotel, motel or apartment hotel) in which living space, without kitchen facilities, is let to five (5) or more persons who are not within the second degree of kinship.

**lot.** A parcel of land including land under water, whether or not platted, in single ownership, and not divided by a street.

—**area.** The horizontal area of the lot exclusive (a) of any area in a street or private way open to public use, and (b) of any fresh-water area more than ten (10) feet from the shoreline, and (c) of any salt-water area below the mean high tide line.

—**corner.** A lot with boundaries abutting on, and meeting at the intersection of, two (2) streets when the lines of such boundaries form within such lot at such intersection an angle of not more than one hundred thirty-five (135) degrees. In the case of a curved boundary, the tangent to such curved boundary at its point of intersection with another boundary of the lot shall be deemed to be the line of such boundary for the purposes of this definition.

- depth.** The horizontal distance between the front and rear lot lines measured by the length, within the lot, of a straight line connecting the midpoint of a straight line between the foremost points of the side lot lines with the midpoint of a straight line between the rearmost points of the side lot lines.
- line, front.** The line separating the lot from the street. The owner of a lot abutting on two (2) or more streets may designate as the front lot line whichever of the two (2) widest streets he chooses.
- line, rear.** The line which most nearly qualifies as the line most distant and opposite from the front lot line; where the lot is irregularly shaped, a line perpendicular to the mean direction of the side lot lines, and at least ten (10) feet in length within the lot.
- width.** The shortest horizontal distance between the side lot lines measured perpendicular to the mean direction of two (2) straight lines, one (1) between the foremost and rearmost points of one (1) side lot line, and the other between the foremost and rearmost points of the other side lot line.
- low pressure boiler.** A steel or cast iron heating boiler in which the maximum allowable gage working pressure is limited to fifteen (15) pounds per square inch.
- manlifts.** See “Special Hoisting and Conveying Equipment.”
- manual fire alarm system.** An interior alarm system composed of sending stations and signaling devices in a building, operated on an electric circuit, so arranged that the operation of any one (1) station will ring all signals throughout the building or at one (1) or more approved locations. Signals may be either non-coded or coded to indicate the floor area in which the signal originated and may be transmitted to an outside central station.
- marquee sign.** A display sign attached to or hung from a marquee canopy or other covered structure projecting from and supported by the building and extending beyond the building wall, building line or street lot line.
- masonry.** A built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum,

stone or other approved units; or monolithic concrete. Reinforced concrete is not classed as masonry.

**masonry solid.** Masonry consisting of solid masonry units laid contiguously with the joints between the units filled with mortar, or consisting of plain concrete.

**masonry unit solid.** A masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is seventy-five (75) per cent or more of its gross cross-sectional area measured in the same plane.

**material lift.** See "Special Hoisting and Conveying Equipment."

**material platform hoist.** A power or manually operated suspended platform conveyance operating in guide rails for the exclusive raising or lowering of materials, which is operated and controlled from a point outside the conveyance.

**may.** A term giving permission but not, except in the negative, making a requirement. "May" is used in this code to emphasize that specified construction is not prohibited by the code when such prohibition might otherwise be implied or construed; or to limit the scope of a prohibition by excepting specified construction from its effect. A permission so expressed in this code in specific terms shall not be construed as a prohibition of other construction. "May not" is prohibitive.

**means of egress.** A means of egress is a continuous path of travel from any point in a building or structure to the open air outside at ground level and consists of three (3) separate and distinct parts: (a) the exitway access, (b) the exitway and (c) the exitway discharge. A means of egress comprises the vertical and horizontal means of travel and may include the room space, doorway, corridor, hallway, passageway, stairs, ramp, lobby and other paths of travel.

**mechanical ventilation.** The process of introducing outdoor air into, or removing vitiated air from a building by mechanical means. A mechanical ventilating system may include air heating, air cooling, or air conditioning components.

**mezzanine floor.** A floor within a story between the floor and ceiling thereof, having an area not over thirty-three and one-third ( $33\frac{1}{3}$ ) per cent of the area of the building at



the level at which the mezzanine floor occurs. A floor of larger area separates two (2) stories.

**mortar.** A plastic mixture of approved cementitious materials, fine aggregates and water used to bond masonry or other structural units.

**motel.** A hotel primarily for transients traveling by automobile, with a parking space on the lot for each lodging unit, and with access to each such unit directly from the outside.

**motor fuel service station.** A structure, building or premise or any portion thereof where a flammable fluid is stored, housed or sold for supply to motor vehicles.

**motor vehicle.** A conveyance propelled by an internal combustion engine and having a fuel storage tank capacity of more than two (2) gallons.

**motor vehicle repair shop.** A building, structure or enclosure in which the general business of repairing motor vehicles is conducted including a public garage.

**moving stairway.** See Escalator.

**moving walk.** A type of passenger-carrying device on which passengers stand or walk, and in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted.

**nominal dimension.**

— **lumber.** A dimension that may vary from actual dimensions as provided in this code including the reference standards.

— **masonry.** A dimension that may vary from actual masonry dimensions by the thickness of a mortar joint but not to exceed one-half ( $\frac{1}{2}$ ) inch.

**nonautomatic sprinkler system.** A sprinkler system in which all pipes and sprinkler heads are maintained dry and which is supplied with water through a fire department siamese connection.

**nonautomatic standpipe system.** A standpipe system in which all piping is maintained dry, and which is supplied with water through a fire department siamese connection.

- nonbearing.** As applied to a wall or partition, shall mean one that supports no vertical load other than its own weight.
- noncombustible (material).** This is a general, relative term. Its precise meaning is defined in this code in article 903.7.1.
- non-corrodible metal.** A metal which, under the conditions of its use, may reasonably be expected, without unusual or excessive maintenance, to serve its purpose throughout the probable life of the structure in which it is used as determined by the building official.
- nonconcurrent loads.** Two (2) or more elements of dead or live load which, for purposes of design, are considered not to act simultaneously.
- nonloadbearing.** See nonbearing.
- occupancy.** The purpose or activity for which a building or space is used or is designed or intended to be used.
- occupancy group.** The category in which a building or space is classified by the provisions of article 2, based on its occupancy or use.
- occupancy load.** The number of individuals normally occupying the building or part thereof, or for which the egress facilities have been designed.
- occupancy, unit of.** That portion of one (1) building within separations within which the occupancy, whether of one (1) or more tenants, falls in a single group as classified in article 2.
- occupied.** As applied to a building, shall be construed as though followed by the words "or intended, arranged or designed to be occupied."
- one-source sprinkler system.** An automatic sprinkler system which is supplied from one (1) of the approved automatic sources of water supply.
- open exterior space.** A street or other public space; or a yard, court, or plaza open on one (1) or more sides and unroofed or open on all sides, which provides egress to a street or public space.
- opening protective.** An assembly of materials and accessories, including frames and hardware installed in an opening in a

wall, partition, floor, ceiling or roof to prevent, resist, or retard the passage of flame, smoke or hot gases.

**or.** Providing an alternative at the option, unless the contrary is clearly indicated, of the applicant for a permit.

**ordinary materials.** Materials which do not conform to the requirements of this code for controlled materials.

**ordinary repairs.** See section 102.2.

**oriel window.** A window projected beyond and suspended from the wall of the building or cantilevered therefrom.

**outer court.** See "Court."

**owner.** The owner of the land as recorded in the registry of deeds for Suffolk county, or as registered in the land court, except that nothing in this code shall be held to prevent the owner of land from transferring to another his rights and responsibilities under this code by means of a lease or other suitable agreement. The building official may recognize the person to whom such a transfer by operation of law or otherwise has been made as the possessor of such rights and responsibilities and to such extent as the owner in receiving applications, issuing permits and otherwise in enforcing this code.

**panel.** (Part of a structure.) The section of a floor or wall comprised between the supporting frame of two (2) adjacent rows of columns and girders or column bands of floor construction.

**panel wall.** See Wall-skeleton or Panel.

**parapet.** See Wall-parapet.

**parking lot, open.** A lot, or portion thereof, used for the storage or sale of more than four (4) motor vehicles, but not used for the repair or servicing of such vehicles.

**partial sprinkler system.** An automatic sprinkler system consisting of a limited number of automatic sprinkler heads serviced from the building water supplies with one (1) or more fire department siamese connections as required, for use in egress facilities and isolated hazardous locations when approved by the building official.

**partition.** An interior vertical unit or assembly of materials that separates one space from another within any story of a building.

**party wall.** See Wall-party.

**penthouse.** An enclosed occupiable structure above the roof of a building, other than a roof structure, extending not more than twelve (12) feet above the roof, and occupying not more than thirty-three and one-third ( $33\frac{1}{3}$ ) per cent of the roof area.

**person.** An individual, partnership, corporation, or other legal entity.

**pier.** A vertical body of masonry used as a column, the portion of a masonry wall between thinner portions or between openings when the horizontal dimensions parallel to the wall does not exceed four (4) times the thickness.

**place of assembly.** An enclosed room or space in which seventy-five (75) or more persons gather for any of the following purposes: religious, recreational, educational, political, social, consumption of food and drink or for similar group activities.

**plan or plans.** The word plan or plans shall be construed to mean drawing or drawings illustrating the work involved.

**plastic.** A material that contains as an essential ingredient an organic substance of large molecular weight, is solid in its finished state and, at some stage in its manufacture or its processing into finished articles, can be shaped by flow.

— **approved combustible.** A plastic which meets the requirements of section 1409.5.2.

— **approved light transmitting.** A plastic which meets the requirements of section 2000.1.

**platform frame.** Light timber construction in which the exterior walls and bearing walls consist of studs which are interrupted at floors by the entire thickness of the floor construction.

**plenum chamber.** A compartment or chamber to which one (1) or more ducts are connected and which form a part of either the supply or return air system.

**pole footing.** A type of construction in which a pole embedded in the ground and extending upward to form a column is used for both column and footing.

**ponding.** The retention of rainwater on roofs.

**posted occupancy.** The posted classification of a building in respect to use, fire grading, floor load and occupancy load.

**posted sign.** The tablet, card, or plate which defines the use, occupancy, fire grading and floor loads of each story, floor or parts thereof for which the building or part thereof has been approved.

**prefabricated.** Construction materials or assembled units fabricated prior to erection or installation in a building or structure.

**prefabricated building.** The completely assembled and erected building or structure, including the service equipment, of which the structural parts consist of prefabricated individual units or subassemblies using ordinary or controlled materials; and in which the service equipment may be either prefabricated or at-site construction.

**prefabricated subassembly.** A built-up combination of several structural elements designed and fabricated as an assembled section of wall, ceiling, floor or roof to be incorporated into the structure by field erection of two (2) or more such subassemblies.

**prefabricated unit.** A built-up section forming an individual structural element of the building, such as a beam, girder, plank, strut, column or truss, the integrated parts of which are prefabricated prior to incorporation into the structure, including the necessary means for erection and connection at the site to complete the structural frame.

**prefabricated unit service equipment.** A prefabricated assembly of mechanical units, fixtures and accessories comprising a complete service unit of mechanical equipment, including bathroom and kitchen plumbing assemblies, unit heating and air-conditioning systems and loop-wiring assemblies of electric circuits.

**private garages.** (See garages)

**professional engineer or architect.** (See architect or engineer.)

**projection room.** A room in a theatre or assembly hall containing a projector of moving pictures.

**protected construction.** That in which all structural members are constructed, chemically treated, covered or protected so that the individual unit or the combined assemblage of all such units has the required fireresistance rating specified for its particular use or application in section 221.1 table 2-1, and includes protected-frame, protected-ordinary and protected-noncombustible construction.

**public garage.** See Garage, public.

**public open space.** An open space in public ownership devoted or to be devoted to a public use with only minor accessory buildings, if any. No structure that exceeds twenty (20) feet in height or two thousand (2000) square feet in gross floor area shall be considered to be a part of such public open space. "Public open space" shall be construed to include a street.

**pyroxylin plastic.** Any nitro-cellulose product or compound soluble in a volatile, flammable liquid, including such substances as celluloid, pyroxylin, fiberloid and other cellulose nitrates (other than nitro-cellulose film) which are susceptible to explosion from rapid ignition of the gases emitted therefrom.

**ramp.** See Runway.

**reference standard.** An approved recognized authoritative source reference for specific use within this code and limited to that use.

**refrigerant.** The medium used to produce cooling or refrigeration by the process of expansion or vaporization.

**refrigeration.** The mechanical process of removing heat from the air in an enclosed space of a building or structure.

**reinforced concrete.** Concrete in which reinforcement other than that provided for shrinkage or temperature changes is combined in such manner that the two (2) materials may act together in resisting forces.

**remote.** See Independent.

**required.** Shall be construed to be mandatory by provisions of this code.

**retaining wall.** See Wall.

**roof.** The topmost slab or deck of a building, either flat or sloping, with its supporting members not including vertical supports.

**roof covering.** The covering applied to the exterior surface of a roof for weather resistance, fireresistance, wear, and/or appearance, but not including insulation.

**roof structure.** A structure above the roof of any part of a building constructed for use with a stairway, tank, elevator machinery or ventilating apparatus, or such part of a shaft as extends above the roof.

**rubble.**

— **coursed rubble.** Masonry composed of roughly shaped stones fitting approximately on level beds and well bonded.

— **random rubble.** Masonry composed of roughly-shaped stones laid without regularity of coursing but well bonded and fitted together to form well defined joints.

— **rough or ordinary rubble.** Masonry composed of unsquared field stones laid without regularity of coursing but well bonded.

— **rubble masonry.** Masonry composed of roughly shaped stones.

**runway.** Any aisle or walkway constructed or maintained as a passageway for pedestrians or vehicles.

**rupture member.** A mechanical device that will rupture at a predetermined pressure to control automatically the compressor or maximum pressure of operation of the refrigerant.

**safe area.** An interior or exterior space that serves as a part of a means of egress by providing a transitional area from, and that also serves as a normal means of entry to, an assembly space.

**scenery and scenic elements.** Any or all of those devices ordinarily used on a stage in the presentation of a theatrical

performance, such as back drops, side tabs, teasers, borders or scrim, rigid flats, set pieces, and all properties, but not including costumes.

**school.** Any building or premises in which a regular course of public or private instruction is afforded to not less than ten (10) pupils at one time, exclusive of rooms in buildings separate from or attached to churches used for the primary purpose of religious instruction.

**seating section.** An area of seating bounded on all sides by aisles, cross over aisles, walls or partitions.

**self-closing.** As applied to an opening protective shall mean a door, window, damper, or other device, and its assembly that is normally kept in a closed position and that is equipped with an approved device to insure immediate closing after having been opened for use.

**service equipment.** See building service equipment.

**shaft.** An enclosure of a vertical opening in two (2) or more stories.

— **covered.** A shaft enclosed at the top.

— **open.** A shaft open to the outdoor air at the top.

**shall.** As used in this code is always to be construed as mandatory.

**siamese connection.** A fitting connected to a fire extinguishing system and installed on the outside of a building, with two (2) hose inlets for use of the fire department, to furnish or supplement the water supply to the system.

**sidewalk shed.** A construction over a public sidewalk, used to protect pedestrians from falling objects.

**sign.** An outdoor structure, banner or other device, designed or used as an advertisement or announcement for the information or attraction of the public; consisting of the framework and all letters, words, numerals, illustrations, illumination, decorations, trade marks, emblems, symbols or other figures or characters.

— **billboard. (poster panel).** A board, panel or tablet used for the display of printed or painted advertising matter.



- **closed sign.** A display sign in which the entire area is solid or tightly enclosed or covered.
  - **display sign.** A structure that is arranged, intended, designed or used as an advertisement, announcement or direction; and includes a sign, sign screen, billboard, poster panel and advertising devices of every kind.
  - **ground sign.** A display sign supported by uprights or braces in or upon the ground surface.
  - **open sign.** A display sign in which at least fifty (50) per cent of the enclosed area is uncovered, or open to the transmission of wind.
  - **poster panel.** See Billboard.
  - **projecting sign.** A display sign which is attached directly to the building wall and which extends more than fifteen (15) inches from the faces of the wall.
  - **roof sign.** A display sign which is erected, constructed and maintained above the roof of the building.
  - **temporary sign.** A display sign, banner or other advertising device constructed of cloth, canvas, fabric or other light temporary material, with or without a structural frame, intended for a limited period of display; including decorative displays for holidays or public demonstrations.
  - **wall sign.** A display sign which is painted on or attached directly to the building wall and which extends not more than fifteen (15) inches from the face of the wall.
- slow-burning plastic.** See plastic, approved.
- smoke damper.** A damper arranged to seal off air flow automatically through a part of an air duct system, so as to restrict passage of smoke. A smoke damper may be a standard louvered damper serving other control functions if its location lends itself to the dual purpose. A smoke damper does not need to meet all the requirements of a fire damper.
- smokepipe.** See chimney connector.
- smokestack.** See chimney.
- smoke screen.** A door or set of doors and assembly placed in a corridor to restrict the spread of smoke and to retard the spread of fire by reducing draft.

**soil.** The softer matter mostly inorganic composing part of the surface of the earth in distinction from firm rock; including gravel, clay, loam and the like and filling materials of similar nature.

**space heater. (Room heater).** An above-the-floor device for direct heating of the space in and adjacent to that in which the device is located without external heating pipes or ducts.

**special hoisting and conveying equipment.** Manually or power-operated hoisting, lowering or conveying mechanisms, other than elevators, moving stairways or dumbwaiters for the transport of persons or freight in a vertical, inclined or horizontal direction on one floor or in successive floors.

—**automotive lift.** A fixed mechanical device for raising an entire motor vehicle above the floor level but not through successive floors of the building or structure.

—**conveyors.** A system of machinery and manual or mechanized devices other than elevator and dumbwaiter equipment consisting of belts, chains, rollers, buckets, aprons, slides and chutes and other miscellaneous equipment for hoisting, lowering and transporting materials and merchandise in packages or in bulk in any direction in a building or structure.

—**manlifts.** A power-operated belt device with steps and handholds for transporting persons in a vertical position through successive floors or levels of the building or structure.

—**material lift.** A power-operated rising or lowering device for transporting freight vertically, operating entirely within one (1) story of the building or structure.

**sprinkler alarm—(water gong).** An apparatus constructed and installed so that a flow of water through the sprinkler system equal to, or greater than, that required for a single automatic sprinkler head will cause an alarm to be given.

**sprinklers.** See Automatic sprinklers.

**sprinkler system.** A system of piping and sprinkler heads connected to one (1) or more sources of water supply.

**sprinkler system, chemical.** A system of automatic sprinklers controlled by thermostatic operating devices for the diffusion of approved fire-extinguishing chemicals or gases.

- sprinkler system, dry pipe.** A system in which all pipes and sprinkler heads are filled with air under pressure and the water supply is controlled by an approved automatic dry-pipe valve in the event of fire, actuated either by the release of air or by thermostatic electric control.
- sprinkler system, supervised.** A system in which all water supply, valves and accessory equipment is provided with electrical contact devices to transmit signals to an outside central supervisory station.
- sprinkler system, thermostatic.** An open or closed head sprinkler system operated through an auxiliary thermostatic device which functions at a predetermined rate of temperature rise.
- sprinkler system, wet pipe.** A system of automatic sprinklers in which all pipes are filled with water at all times.
- sprinklered.** Equipped with an approved automatic sprinkler system properly maintained.
- stage.** A raised portion of floor for staging purposes exceeding eighteen (18) feet or more in depth behind the curtain line.
- stair, rise of.** The vertical distance between successive treads or steps measured always from the same relative position thereon.
- stair, tread of.** The horizontal distance from one riser to the next or from one nosing to the next.
- stairway.** One or more flights of stairs and the necessary landings and platforms connecting them to form a continuous and uninterrupted passage from one floor to another.
- standard fire test.** The standard controlled furnace test formulated under the procedure outlined in reference standard RS9-2.
- standpipe, dry.** A standpipe fire line without permanent or automatic water supply equipped with a siamese connection for use of the fire department.
- standpipe system.** A system of piping, for fire-fighting purposes, consisting of connections to one (1) or more sources of water supply, and serving one (1) or more hose outlets.
- standpipe, wet.** A standpipe fire line having a primary water supply constantly available at every hose outlet, or made

available by opening the hose outlet or by automatic functioning of a control station.

**steel joist.** Any secondary steel member of a building or structure made of hot or cold-formed solid or open-web sections, or riveted or welded bar, strip or sheet-steel members or slotted and expanded or otherwise deformed rolled sections.

**story.** That portion of a building included between the top surface of a floor and the top surface of the next floor or roof above.

**street.** A public way, alley, lane, court, sidewalk and such parts of public squares and public places as form travelled parts of highways.

**street line.** The line separating a street from a lot.

**structural steel member.** Any member of a building or structure consisting of rolled steel structural shapes other than formed steel, light gage steel or steel joist members.

**structure.** A combination of materials assembled at a fixed location to give support or shelter, such as a building, bridge, trestle, tower, framework, retaining wall, tank, tunnel, tent, stadium, reviewing stand, platform, bin, fence, sign, flagpole, or the like. The word "structure" shall be construed, where the context allows, as though followed by the words "or part thereof."

**thermoplastic material.** A solid plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

**thermosetting material.** A solid plastic material which is capable of being changed into a substantially infusible and insoluble product when cured under the application of heat or by mechanical means.

**ton of refrigeration.** The unit of capacity of refrigeration equivalent to the removal of heat at the rate of twelve thousand (12,000) B.T.U. per hour.

**two-source system.** An automatic sprinkler system which is supplied from a combination of any two (2) of the approved automatic sources of water supply, or from two (2) pressure tanks, or by direct connections to the municipal water supply

on two (2) streets in which the water mains are separately controlled.

**unfired pressure vessel.** A closed metal vessel which contains air, steam, gas or liquid pressure in excess of fifty (50) pounds per square inch gage which is supplied from an external source.

**uniformly distributed load.** A conventional representation of an element of dead or live load as a load of uniform intensity, distributed over an area.

**unit heater.** An appliance which consists of an integral combination of heating element and fan within a common enclosure and which is located within or adjacent to the space to be heated.

**use. (used).** As a verb, shall be construed as if followed by the words "or is intended, arranged, designed, built, altered, converted, rented or leased to be used."

**use group.** See occupancy group.

**ventilation.** The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

**vestibule.** An enclosed space, with doors or opening protectives, to provide protected passage between the exterior and interior of a building, or between spaces within a building.

**wall.**

—**apron wall.** That portion of a skeleton wall below the sill of a window.

—**bearing wall.** A wall which supports any vertical load in addition to its own weight.

—**cavity wall.** A wall built of masonry units or of plain concrete, or a combination of these materials, arranged to provide an air space within the wall, and in which the inner and outer parts of the wall are tied together with metal ties.

—**composite wall.** A wall built of a combination of two (2) or more masonry units of different materials bonded together, one (1) forming the back-up and the other the facing elements.

- curtain wall.** A nonbearing enclosure wall not necessarily supported at each story.
  - enclosure wall.** A wall, bearing or nonbearing, which encloses a stairway, elevator shaft or other vertical opening.
  - faced wall.** A wall in which the masonry facing and backing are so bonded as to exert common action under load.
  - fire wall.** A vertical type A fire division in the form of a wall.
  - hollow wall.** A wall built of units so arranged as to provide an air space within the wall, and in which the facing and backing of the wall are bonded together.
  - nonbearing wall.** A wall which supports no vertical load other than its own weight.
  - panel wall.** See skeleton.
  - parapet wall.** That part of any wall entirely above the roof line.
  - party wall.** A wall on an interior lot line used or adapted for joint service between two (2) buildings.
  - retaining wall.** A wall designed to resist lateral pressure.
  - skeleton or panel wall.** A nonbearing wall supported at each story on a skeleton frame.
  - spandrel wall.** That portion of a skeleton wall above the head of a window or door.
  - veneered wall.** A wall having a facing of masonry or other weather-resisting noncombustible materials securely attached to the backing, but not so bonded as to exert common action under load.
- wall heater.** A unit heater which is supported from or recessed in the wall of the room or space to be heated.
- warm air furnace.** A solid, liquid, gas-fired, or electric appliance for heating air to be distributed with or without duct systems to the space to be heated.

**warm air furnace, mechanical.** A warm air furnace equipped with a fan to circulate the air.

**water curtain.** A system of approved open or closed sprinkler heads or perforated pipes installed on the exterior of a building at eaves, cornices, window openings, and on mansard or peak roofs with water supply under manual control; or installed around openings in floors or walls of a building with water supply under thermostatic control.

**width.**

—**inner court.** As applied to an inner court, means its least horizontal dimension.

—**outer court.** As applied to an outer court, means the shortest horizontal dimension measured in a direction substantially parallel with the principal open end of such court.

**workmen's hoist.** A hoisting and lowering mechanism equipped with a car that moves in guides in a substantially vertical direction and that is used primarily for raising and lowering workmen to the working levels.

**writing.** The term shall be construed to include handwriting, typewriting, printing, photo-offset or any other form of reproduction in legible symbols or characters.

**written notice.** A notification in writing delivered in person to the individual or to the parties intended or delivered at or sent by **certified or registered mail** to the last business address known to the party giving the notice.

**yard, front.** An open space extending across the full width of the lot and lying between the front lot line and the nearest building.

**yard, rear.** An open space immediately behind the rearmost main building on the lot and extending across the full width of the lot.

**yard, side.** An open space along the side line of a lot, extending from the front yard line to the rear yard line; in the case of a side yard abutting on a street, extending to the rear lot line.

**zoning.** The reservation of certain specified areas within the City of Boston for building and structures, or use of land, for certain purposes with other limitations such as height, lot coverage and other stipulated requirements.

## **SECTION 202.0. OCCUPANCY GROUP CLASSIFICATION**

Every building, structure and all spaces therein shall be classified with respect to use or occupancy in accordance with the provisions of section 203 through 213 according to the occupancy or use of the building and spaces therein. The list of representative occupancies in reference standard RS2-1 shall be used for this purpose.

**202.1. Fire Grading of Buildings.**—All buildings and structures shall be graded in accordance with the degree of fire hazard of their occupancy in terms of hours and fractions of an hour and as regulated in section 902.

**202.2. New Occupancies.**—The building official shall establish by approved rules the degree of hazard involved and the fire grading of any occupancy not specifically provided for in this code.

## **SECTION 203.0. OCCUPANCY GROUP A—HIGH HAZARD BUILDING**

Buildings and spaces shall be classified in the high hazard occupancy group when they are used for storing, manufacturing, or processing potentially explosive products or materials, or highly-combustible or high-flammable products or materials that are likely to burn with extreme rapidity. The high hazard group shall also include: occupancies that involve storing, processing, or handling any materials that produce explosive dust, or that result in the division of matter into fine particles subject to spontaneous ignition; occupancies that employ solids or substances that ignite or produce flammable gases on contact with water; and any other occupancies that constitute a high fire hazard because of the form, character, or volume of the materials involved. The storage and use of flammables are subject to rules and regulations of the City of Boston Licensing Board.

**203.1. Typical Material Contents.**—Acetylene gas and gases under pressure of fifteen (15) psi or more and in quantities greater than twenty-five hundred (2,500) cubic feet, including hydrogen, illuminating gas, natural gas, and all other gases



subject to explosion; celluloid and celluloid products; cotton batting; kerosene, fuel, or other oils having a flash point under two hundred (200) degrees F. (Tag. closed cup) except five hundred and fifty (550) gallons or less in one and two-family dwellings; refrigerating systems using high hazard refrigerants as defined in article 18.

**203.2. Typical Occupant Activities.**—Artificial flower and synthetic leather manufacture; ammunition, and explosives manufacture, sales or storage; dry cleaning or dyeing using or storing gasoline or other combustible solvents as outlined in section 413.0; feather renovating; fruit ripening processes; hydrogenation processes; match manufacture or storage; metal enamelling or japanning; paint and varnish manufacture; paint spraying or dipping, as specified in section 412.0 derivation of petroleum products by application of heat, processing of paper or cardboard in loose form; pyroxylin products manufacture and storage; rag sorting and storage; shoe polish manufacture; straw goods manufacture or broom corn storage; tar, pitch, or resin processing; waste paper sorting, shredding, storage, or baling; cotton waste processes.

**203.3. Representative Occupancies.**—Paintshop and storerooms; industrial smoke houses; grain elevators; tanneries with enamelling or japanning; distilleries; sugar, starch, cereal, feed, flour, and grist mills.

## **SECTION 204.0. OCCUPANCY GROUP B—STORAGE BUILDINGS**

Buildings and spaces shall be classified in the storage occupancy group when they are used primarily for storing goods. However, limited storage incidental to the display, sale, or manufacture of such goods is excepted. When the goods stored are highly combustible, flammable, or potentially explosive, the building or space shall meet the requirements for high hazard occupancies when the latter are more restrictive than the corresponding requirements for the storage classification. The storage occupancy group consists of sub-groups B-1 and B-2.

**204.1. Occupancy Group B-1.**—Shall include buildings and spaces used for storing any flammable or combustible materials that are likely to permit the development and propagation of fire with moderate hazard but which do not produce either poisonous gases, fumes or explosives.

**204.1.1. Typical Material Contents.**—Bags (cloth, burlap, and paper); bamboo and rattan; baskets; belting (canvas and leather); books and paper in rolls or packs; buttons, including cloth-covered, pearl, or bone; boots and shoes; cardboard and cardboard boxes; wearing apparel; cordage; furniture; furs; glue; mucilage, paste, and size; horn and combs other than celluloid; linoleum; livestock; lumber; photo-engraving supplies; silk, soap; sugar; tobacco; cigars, cigarettes, and snuff; upholstery and mattresses; wax candles.

**204.1.2. Typical Occupant Activities.**—Photo engraving; leather enamelling or japanning.

**204.1.3. Representative Occupancies.**—Warehouses, storeroom, freight depots, stables, coal pockets, lumber yards, group 1—public garages; petroleum warehouses for storage of lubricating oils with a flash point of three hundred (300) degrees F or higher (see section 905.3).

**204.2. Occupancy Group B-2.**—Shall include buildings and spaces used for storing non-combustible materials and materials that do not ordinarily burn rapidly.

**204.2.1. Typical Material Contents.**—Asbestos, chalk and crayons, food products, glass, ivory, metals, porcelain and pottery, talc and soapstones.

**204.2.2. Typical Occupant Activities.**—Wholesaling.

**204.2.3. Representative Occupancies.**—Warehouses; storerooms; private garages; greenhouses; group 2—public garages.

## **SECTION 205.0. OCCUPANCY GROUP C—MERCANTILE BUILDINGS**

Buildings and spaces shall be classified in the mercantile occupancy group when they are used for display and sales of goods accessible to public inspection. Highly combustible or flammable goods, such as those made of pyroxylin products shall be limited to small quantities that do not constitute a high hazard; if not so limited, the occupancy shall meet the requirements for high hazard occupancies when the latter are more restrictive than the corresponding requirements for the mercantile classification.

**205.1. Representative Occupancies.**—Retail stores; shops; sales-rooms; markets; public auction rooms.

## **SECTION 206.0. OCCUPANCY GROUP D— INDUSTRIAL BUILDINGS**

Buildings and spaces shall be classified in the industrial occupancy group when they are used for fabricating, assembling, manufacturing, or processing products, materials, or energy, except that when any products or materials, or other products or materials used in their manufacture are highly combustible, flammable, or explosive, the occupancy shall meet the requirements for high hazard occupancies when the latter are more restrictive than the corresponding requirements for the industrial classification. The industrial occupancy group consists of subgroups D-1 and D-2.

**206.1. Occupancy Group D-1.**— Shall include buildings and spaces in which the fabrication, assembly, manufacturing, or processing represents a moderate fire hazard due to the extent and nature of such operations, or to the materials involved.

**206.1.1. Typical Occupant Activities.**— Canning, including food products and condensed and powdered milk manufacturer; dry cleaning or dyeing using or storing solvents having a flash point between one hundred (100) degrees F and one hundred thirty-eight and two-tenths (138.2) degrees F (Tag. closed-cup); electrolytic processes; glass manufacture, leather tanning and treating, excluding enamelling or japanning; sugar refining; textile milling, including canvas, cotton, cloth, bagging, burlap, carpets, and rugs; upholstering; woodworking; cotton dressmaking; and manufacturing or processing materials such as those outlined in section 204.1.1.

**206.1.2. Representative Occupancies.**— Baking plants, breweries; motor vehicle repair shops; foundries; heliports; scenery shops.

**206.2. Occupancy Group D-2.**— This group shall include buildings and spaces in which the fabrication, assembly, manufacturing, or processing represents a low fire hazard.

**206.2.1. Representative Occupancies.**— Mechanical and electrical equipment rooms; commercial laundries; vocational training shops; laboratories; boiler and furnace rooms; nonresidential kitchens; power plants.

**206.3. Special Industrial Uses.**— All buildings and structures designed to house low hazard industrial processes, including among others the production and distribution of electric, gas or steam power and rolling mills and foundries, requiring large areas and unusual heights to accommodate craneways or special machinery and equipment shall be exempt from the height and area limitations of section 221.2 table 2-2.

**206.3.1. Construction.**—Buildings and structures for such special industrial uses shall comply with the requirements of section 309.0 except as to height and when constructed of non-combustible (type 2-C) construction may have balconies and mezzanine floors which do not exceed two-thirds (2/3) the area of the main floor in any one tier.

**206.3.2. Enclosure Walls.**—The enclosure walls of buildings of such low hazard industrial uses shall be constructed of approved non-combustible and weather resisting materials and when located with a fire separation of less than thirty (30) feet from interior lot lines of any other building shall be protected or constructed to provide a fire resistance rating of not less than two (2) hours.

**206.3.3. Firefighting and Extinguishing Equipment.**—Special use industrial buildings as herein defined shall comply with the requirements of article 12 for auxiliary fire extinguishing equipment; except that the provisions of section 309.0 for automatic sprinkler equipment in unlimited area buildings may be waived by the building official when such installations would be detrimental or dangerous to the specific use and occupancy.

## **SECTION 207.0. OCCUPANCY GROUP E—BUSINESS BUILDINGS**

Buildings and spaces shall be classified in the business occupancy group when they are occupied for transacting business; for rendering professional services, or for performing other commercial services that may incidentally involve the storage of limited quantities of stocks of goods for office use or purposes. Building and spaces used for prosecuting public or civic services shall also be classified in this group.

**207.1. Representative Occupancies.**—Office buildings; banks; civic administration buildings; radio and television stations; telephone exchanges; barber and beauty shops; automotive service stations.

## **SECTION 208.0. OCCUPANCY GROUPS F AND G ASSEMBLY AND SCHOOL BUILDINGS**

Buildings and spaces shall be classified in the assembly occupancy group when they are used or designed as places of assembly as defined in article 2. The assembly occupancy group consists of sub-groups F-1 through F-5.

**208.1. Occupancy Group F-1.**—Shall include those indoor places of assembly in which, during the major period of occupancy, the persons assembled comprise a seated or otherwise passive audience to a performance or presentation, and have their attention focused in a common direction or at a common subject. Occupancy group F-1 consists of two (2) subdivisions F-1a and F-1b.

**208.1.1. Occupancy Group F-1a.**—Includes all F-1 places of assembly using scenery and scenic elements including such representative occupancies as theaters, playhouses, opera houses.

**208.1.2. Occupancy Group F-1b.**—Includes all F-1 places of assembly not using scenery and scenic elements including such representative occupancies as motion picture theatres, convention halls, concert halls, sports arenas, planetariums.

**208.2. Occupancy Group F-2.**—Shall include those indoor places of assembly in which, during the major period of occupancy, the persons assembled are physically active and do not have a common center of attention; entertainment or for similar purposes including all rooms, lobbies and other spaces connected thereto with a common means of egress.

**208.2.1. Representative Occupancies.**—Restaurants; night clubs; cabarets; dance halls; ballrooms; banquet rooms; cafeterias; snack bars; taverns; coffee houses.

**208.3. Occupancy Group F-3.**—Shall include those indoor places of assembly in which, during the major period of occupancy, the persons assemble for amusement, entertainment or recreation, incidental motion picture, dramatic, theatrical or educational presentations, lectures or other similar purposes not provided for in groups F-1 and F-2 and principally used without permanent seating facilities.

**208.3.1. Representative Occupancies** —Exhibition halls, art galleries, museums, gymnasiums, lecture halls, passenger terminals, bowling alleys, billiard parlors, skating rinks; recreation centers, funeral establishments.

**208.4. Occupancy Group F-4.**—Shall include those buildings and spaces used as churches or for similar religious purposes.

**208.4.1. Representative Occupancies.**—Libraries, churches.

**208.5. Occupancy Group F-5.**—Shall include all outdoor places of assembly.

**208.5.1. Representative Occupancies.**—Grandstands, bleachers, coliseums, stadiums, drive-in theatres, tents and similar structures.

**208.5.2.** The buildings and structures in this group shall comply with the provisions of this code for special uses and occupancies—see article 4.

**208.6. Occupancy Group G.**—Shall include those buildings and spaces or premises in which a regular course of public or private instruction is afforded to not less than ten (10) pupils at one time. Rooms in buildings separate from or attached to churches used for the primary purpose of religious instruction are regulated under occupancy group F4.

**208.6.1. Representative Occupancies.**—Schools; academies; universities; colleges.

## **SECTION 209.0. OCCUPANCY GROUP H— INSTITUTIONAL BUILDINGS**

Buildings and spaces shall be classified in the institutional occupancy group when persons suffering from physical limitations because of health or age are harbored therein for care or treatment; when persons are detained therein for penal or correctional purposes; or when the liberty of the inmates is restricted. The institutional occupancy group consists of sub-groups H-1 and H-2.

**209.1. Occupancy Group H-1.**—Shall include buildings and spaces used for the detention of persons under restraint.

**209.1.1. Representative Occupancies.**—Jails, prisons, reformatories, mental institutions, cell areas of police stations.

**209.2. Occupancy Group H-2.**—Shall include buildings and spaces used for the care or treatment of persons with physical limitations because of health or age.

**209.2.1. Representative Occupancies.**—Hospitals; sanitariums; clinics; nursing homes; orphanages; homes for the aged; day nurseries.

## **SECTION 210.0. OCCUPANCY GROUP L— RESIDENTIAL BUILDINGS**

Buildings and spaces shall be classified in the residential occupancy group when families or households dwell therein, or when sleeping accommodations, with or without dining facilities, are provided therein for individuals. Excluded from this group are those buildings and spaces classified under the institutional occupancy group. The residential occupancy consists of sub-groups L-1, L-2 and L-3.

**210.1. Occupancy Group L-1.**—Shall include buildings and spaces that are primarily occupied for the shelter and sleeping accommodation of individuals on a day-to-day or week-to-week basis.

**210.1.1. Representative Occupancies.**—Hotels; motels; lodging houses, rooming houses.

**210.2. Occupancy Group L-2.**—Shall include buildings with three or more dwelling units that are primarily occupied for the shelter and sleeping accommodation of individuals on a month-to-month or longer-term basis.

**210.2.1. Representative Occupancies.**—Apartment houses; school dormitory buildings; college fraternity and sorority houses.

**210.3. Occupancy Group L-3.**—Shall include buildings occupied as one-family or two-family dwellings, or as convents or rectories.

**210.3.1. Representative Occupancies.**—One-family and two-family dwellings; rectories; convents.

## **SECTION 211.0. OCCUPANCY GROUP M— MISCELLANEOUS**

Structures of a temporary character, and minor occupancies not classified in any other specific occupancy group, shall be classified in the miscellaneous occupancy group. Such structures and occupancies shall be constructed, equipped, and maintained to meet the requirements of this code commensurate with the fire and life hazard incidental to their use. The miscellaneous occupancy group includes all accessory structures such as sheds, fences, and similar constructions.

**211.1. Representative Structures.**—Sheds, fences, signs.

## **SECTION 212.0. DOUBTFUL OCCUPANCIES**

When a building or space is used for an occupancy not specifically provided for in this code, or when its classification is otherwise uncertain, such building or space shall be included in the occupancy group that it most nearly resembles with respect to the existing or proposed life and fire hazard, and it shall be so classified by the architect or engineer subject to the approval of the building official.

## **SECTION 213.0. MIXED AND/OR MULTIPLE OCCUPANCY**

**213.1. Two or More Occupancies.**—In case a building is occupied for two (2) or more uses not included in the same occupancy group, the provisions of this code applying to each occupancy shall be applied as follows:

**213.1.1. Multiple Occupancy.**—When the building or space is used for multiple purposes, involving different activities at different times, the building or space shall be given a separate occupancy group classification for each of the activities involved. The design and construction of the building or space shall be in accordance with the most restrictive provisions of this code that apply to any of the occupancy group classifications utilized.

**213.1.2. Mixed Occupancy.**—When any space within a building has an occupancy group classification other than that for which the building is classified and occupies ten (10) percent or more of the total net floor area of the building, that space shall be separated horizontally and vertically from all adjoining occupancies by construction meeting the fire resistance rating requirements for Type A-Fire Divisions as provided for in article 9 and such occupancies shall for the purpose of this code be classified and treated as separate buildings and referred to as a building section. When the space in question occupies less than ten (10) percent of the total net floor area, it shall be separated horizontally and vertically from all adjoining occupancies by construction meeting the fire resistance rating requirements for Type B-Fire Division as provided for in article 9.

## **SECTION 214.0. CONSTRUCTION CLASSIFICATION**

Every structure, building, room, or space hereafter altered or erected shall for the purposes of this code be classified in one (1) or in a combination of the four (4) construction types herein defined: Type 1, Fireproof Construction; Type 2, Noncombustible Construction; Type 3, Exterior Masonry Wall Construction; and Type 4, Frame Construction.

**214.1. False Designation.**—No building or space shall be designated a given construction type unless it conforms to the minimum requirements for that type; and no building or space shall be posted, used, designated, or advertised as of a given



construction type unless it complies with the minimum requirements of this code for that type.

**214.2. Minimum Requirements.**—When a superior type of construction is used than the minimum herein required for any specified use, height and area of the building, nothing in this code shall be construed to require full compliance with the specifications for the higher type; but the designated construction classification of the building shall be that of the lesser requirement, unless all the requirements for the higher type are fulfilled.

**214.3. Mixed Construction.**—When two (2) or more types of construction occur within the same building, the entire building shall be subject to the most restrictive occupancy and size limitations for the type of construction involved. However, if the occupancy within the different classes of construction are completely separated by construction that meets the fireresistance rating requirements for Type A fire divisions listed in section 221.1 table 2-1 then each occupancy so separated may, for the purposes of this code, be considered as a separate building (“building section”).

**214.3.1. Restrictions.**—In buildings of mixed construction, no structural element shall be supported by construction having a lower fireresistance rating than that required for the element being supported.

**214.4. Hazardous Occupancies.**—For hazardous occupancies involving an exceptionally high degree of fire risk or an exceptionally high concentration of combustible or flammable contents, the building official may increase the requirements of section 221.1 table 2-1.

## SECTION 215.0. TYPE 1—FIREPROOF CONSTRUCTION

Buildings and structures of fireproof construction are those in which the walls, partitions, structural elements, floors, ceilings, and roofs, and the means of egress parts are constructed and protected with noncombustible materials to afford the fire-resistance specified in section 221.1 table 2-1, except as otherwise specifically regulated by the provisions of article 9. Fireproof buildings shall be further classified as types 1A and 1B in which their bearing walls and other major structural elements are generally of four (4) hour and three (3) hour fireresistance ratings respectively. Fire-retardant treated wood may be used as specified in section 221.1 table 2-1 and section 903.8.

## **SECTION 216.0. TYPE 2—NONCOMBUSTIBLE CONSTRUCTION**

Buildings and structures of noncombustible construction are those in which the walls, partitions, structural elements, floors, ceilings and roofs, and the means of egress parts are constructed of approved noncombustible materials meeting the fireresistive requirements specified in section 221.1 table 2-1, except as modified by the fire district limitations of article 3, and as further regulated in article 9. Noncombustible buildings shall be further classified as types 2A, 2B and 2C in which their bearing walls and other major structural elements are generally of two (2) hour fireresistance rating, three-quarter (3/4) hour fireresistance rating or of no fireresistance rating respectively. Fire-retardant treated wood may be as specified in section 221.1 table 2-1 and section 903.8.

## **SECTION 217.0. TYPE 3—EXTERIOR MASONRY WALL CONSTRUCTION**

Buildings and structures of exterior masonry wall construction are those in which the exterior, fire and party walls are constructed of masonry or other approved noncombustible materials, of the required fireresistance and structural properties; and the floors, roofs and interior framing are wholly or partly of wood or of metal or other approved construction; the fire and party walls are ground supported; except that girders and their supports carrying walls of masonry shall be protected to afford the same degree of fireresistance as the walls supported thereon; and all structural elements have the required fireresistance rating specified in section 221.1 table 2-1. Type 3 buildings shall be further classified as types 3A, 3B and 3C to reflect the fire resistive properties of their framing components.

**217.1. Type 3A.**—Buildings and structures of heavy timber construction are those in which fireresistance is attained by placing limitations on the minimum sizes of wood structural members and on minimum thickness and composition of wood floors and roofs; by the avoidance, or by the proper protection by firestopping or other acceptable means, of concealed spaces under floors and roofs; by the use of approved fastenings, construction details, and adhesives for structural members; and by providing the required degree of fire resistance in exterior and interior walls. (See section 854.0 for construction details.)

**217.1.1. Columns.**—Wood columns may be sawn or glued laminated and shall be not less than eight (8) inches, nominal, in any dimension when supporting floor loads and not less than six (6) inches, nominal, in width and not less than eight (8) inches, nominal, in depth when supporting roof and ceiling loads only.

**217.1.2. Floor Framing.**—Beams and girders of wood may be sawn or glued laminated and shall be not less than six (6) inches, nominal, in width and not less than ten (10) inches, nominal, in depth. Framed or glued laminated arches which spring from the floor line and support floor loads shall be not less than eight (8) inches, nominal, in any dimension. Framed timber trusses supporting floor loads shall have members of not less than eight (8) inches, nominal, in any dimension.

**217.1.3. Roof Framing.**—Framed or glued laminated arches for roof construction which spring from the floor line or from grade and do not support floor loads shall have members not less than six (6) inches, nominal, in width and not less than eight (8) inches, nominal, in depth for the lower half of the height and not less than six (6) inches, nominal, in depth for the upper half. Framed or glued laminated arches for roof construction which spring from the top of walls or wall abutments, framed timber trusses, and other roof framing which do not support floor loads, shall have members not less than four (4) inches nominal, in width and not less than six (6) inches, nominal, in depth. Spaced members may be composed of two (2) or more pieces not less than three (3) inches, nominal, in thickness when blocked solidly throughout their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate of not less than two (2) inches, nominal, in thickness, secured to the underside of the members. Splice plates shall be no less than three (3) inches, nominal, in thickness. When protected by approved automatic sprinklers under the roof deck, framing members shall be not less than three (3) inches, nominal, in width.

**217.1.4. Flooring.**—Floors shall be without concealed spaces and shall be of sawn or glued laminated plank, splined, or tongue-and-groove, of not less than three (3) inches, nominal, in thickness covered with one (1) inch, nominal, dimension tongue-and-groove flooring, laid crosswise or diagonally, or of

planks not less than four (4) inches, nominal, in width set on edge close together and well spiked, and covered with one (1) inch, nominal, dimension flooring.

**217.1.5. Roof Decking.**—Roofs shall be without concealed spaces and roof decks shall be sawn or glued laminated, splined or tongue-and-groove plank, not less than two (2) inches, nominal, in thickness, and one and one-eighth (1-1/8) inches thick interior plywood (exterior glue), or of planks not less than three (3) inches, nominal, in width, set on edge close together and laid as required for floors. Other types of decking may be used if providing equivalent fireresistance and structural properties.

**217.1.6. Bearing Walls.**—Bearing portions of exterior and interior walls shall be of approved noncombustible material and shall have a fireresistance rating of not less than two (2) hours.

**217.1.7. Nonbearing Walls.**—Nonbearing portions of exterior walls shall be of approved noncombustible materials except as otherwise noted and; where horizontal separation of less than twenty (20) feet is provided, nonbearing exterior walls shall have a fire resistance rating of not less than two (2) hours. Where a horizontal separation of twenty (20) feet to thirty (30) feet is provided, nonbearing exterior walls shall have a fire resistance rating of not less than one (1) hour. Where a horizontal separation of thirty (30) feet or more is provided, no fire resistance rating is required. Where a horizontal separation of twenty (20) feet or more is provided wood columns and arches conforming to heavy timber sizes may be used externally.

**217.2. Type 3-B.**—Structures of type 3-B (ordinary protected) shall include all exterior masonry wall buildings in which the interior structural elements are wholly or partly of fire-protected wood of not less than two (2) inch nominal thickness, or of other approved protected combustible materials, or of metal protected and insulated to afford three-quarter (3/4) hour fire-resistance where specified in section 221.1 table 2-1.

**217.3. Type 3-C.**—Structures of type 3-C (ordinary unprotected) construction shall include all exterior masonry wall buildings in which the interior structural members are of wood of not less than two (2) inch nominal thickness or consist of other combustible or noncombustible materials with protection of less than three-quarter (3/4) hour fireresistance rating.

## SECTION 218.0. TYPE 4—FRAME CONSTRUCTION

Buildings and structures of frame construction are those in which the exterior walls, bearing walls, partitions, floor and roof construction are constructed wholly or partly of wood stud and joist assemblies with a minimum nominal dimension of two (2) inches, or of other approved combustible materials; with firestopping at all vertical and horizontal draft openings as regulated in section 877, and in which the structural elements have the required fireresistance ratings specified in section 221.1 table 2-1. Frame buildings shall be further classified as types 4-A and 4-B in which the exterior walls, bearing walls, floors, roofs, and interior framing are generally of wood or other combustible materials having the required fireresistance ratings or having no fireresistance ratings respectively.

## SECTION 219.0. SUBDIVISION OF ATTIC SPACES

The attic spaces of all buildings, except where the roof and attic are of noncombustible or fireproof construction, shall be subdivided in accordance with the applicable requirements of section 921.0 by means of approved fire stops. When doors or other openings are provided in such subdividing partitions, they shall be of noncombustible or similarly protected materials and the construction shall be tightly fitted around all ducts or other assemblies piercing such partitions.

## SECTION 220.0. TEMPORARY STRUCTURES

Pursuant to a variance granted by the board of appeals under the provisions of Part I section 117, the building official may issue a permit for temporary construction as approved by the board of appeals. Such permits shall be limited as to time of service, but in no case shall such temporary construction be permitted for more than one (1) year.

**220.1. Special Approval.**—All temporary construction shall conform to structural strength, fire safety, means of egress facilities, light, ventilation and sanitary requirements of this code necessary to insure the public health, safety and general welfare.

**220.2. Termination of Approval.**—The building official is hereby authorized to terminate such special approval and to order the demolition of any such construction at his discretion, or as directed by the decision of the board of appeals.

# SECTION 221.0. FIRE RESISTANCE RATING AND GENERAL HEIGHT AND AREA LIMITATIONS

## 221.1 Table 2-1 Fire Resistance Rating of Structural Elements in Hours

STRUCTURAL ELEMENT	TYPE OF CONSTRUCTION											
	TYPE 1			TYPE 2			TYPE 3			TYPE 4		
	NONCOMBUSTIBLE			EXTERIOR MASONRY WALLS			FRAME					
FIREPROOF			HEAVY TIMBER (MILL)			ORDINARY			UNPROTECTED			
1A	1B	2A	2B	2C	3A	3B	3C	4A	4B	4C	4D	
1 EXTERIOR WALLS Note 1	4	3	2	3/4	0	2	2	3/4	0	2	3/4	0
	0	0	0	0	0	0	0	0	0	0	0	0
	4	3	2	1 1/2	3/4	2	2	3/4	2	2	3/4	3/4
	2	2	1 1/2	3/4	3/4	2	2	3/4	2	2	3/4	3/4
	4	3	2	3/4	0	2	2	3/4	2	2	3/4	0
	2	2	1 1/2	3/4	0	2	2	3/4	2	2	3/4	0
2 Interior bearing walls and bearing partitions	4	3	2	3/4	0	2	2	3/4	0	2	3/4	0
	4	3	2	2	2	2	2	2	2	2	2	2
3 Fire walls	In no case less than requirements of section 902											
4 Fire divisions	FIRE RESISTANCE RATING CORRESPONDING TO REQUIREMENTS OF SEC. 902											
5 Enclosure of exitways in buildings of four stories or more and for shafts	2	2	2	2	2	2	2	2	2	2	2	2
	Noncombustible											
6 Elevator hoistways	2	2	2	2	2	2	2	2	2	2	2	2
	Noncombustible											
7 Enclosure of exitways in buildings of three stories or less, corridor partitions and vertical separation of tenant spaces	3/4	3/4	3/4	3/4	0	3/4	3/4	3/4	0	3/4	3/4	0
	Note 6											
8 Other nonbearing partitions (See Article 9)	Noncombustible											
	Note 6											
9 Columns, girders, trusses, (other than roof trusses) and framing	3	2	1 1/2	3/4	0	See sec 217	3/4	3/4	0	See sec 217	3/4	0
	4	3	2	3/4	0	See sec 217	3/4	3/4	0	See sec 217	3/4	0
10 Structural members supporting wall	REQUIRED FIRE RESISTANCE OF WALL SUPPORTED BUT NOT LESS THAN FIRE RESISTANCE RATING FOR TYPE OF CONSTRUCTION											
	3	2	1 1/2	3/4	0	See sec 217	3/4	3/4	0	See sec 217	3/4	0
11 Floor construction including beams	2	1 1/2	3/4	3/4	0	See sec 217	3/4	3/4	0	See sec 217	3/4	0
	Note 5											
12 Roof construction including beams 15' or less in height	3/4	3/4	3/4	3/4	0	See sec 217	3/4	3/4	0	See sec 217	3/4	0
	Note 6											
Roof trusses and framing including arches and roof deck	0	0	0	0	0	See sec 217	0	0	0	See sec 217	0	0
	Note 6											
20' or more in height to lowest member	0	0	0	0	0	See sec 217	0	0	0	See sec 217	0	0
	Note 6											

**Notes on Table 2-1**

1. The fire separation or fire exposure in feet as herein limited applies to the distance from other buildings on the site, or from an interior lot line or from the opposite side of a street or other public space not less than thirty (30) feet wide to the building wall. (See Definitions, section 201.0.)
2. Protected exteriors shall be required within the fire limits in type 2 construction as follows: high hazard occupancies, two (2) hour fire resistance with fire separation up to eleven (11) feet.
3. Party walls in type 4 buildings shall be as follows: one- and two-family dwellings, three-quarter (3/4) hour fireresistance. (See section 907.3) Other occupancies two (2) hours, but not less than the fire grading of the occupancy group. (See section 902.4 table 9-2.)
4. In all buildings in which the roof framing may be unprotected, roof slabs and decking may be noncombustible without fireresistance rating except that in buildings not more than five (5) stories in height, roof decking may be of mill type construction or of any other materials providing equivalent fireresistant and structural properties. (See sections 217 and 915.)
5. In Type 3A construction members which are of material other than heavy timber shall have a fireresistance rating of not less than three-quarter (3/4) hours.
6. Fire retardant treated wood, complying with section 903.7.2 may be used as provided in section 903.8.

221.2 Table 2-2

**General Height and Area Limitations  
of One Story Buildings Facing on One  
Street or Public Space Not Less Than 30 Feet Wide**

NP — not permitted  
☒ — unlimited

AREAS IN SQUARE FEET; HEIGHTS IN NUMBER OF STORIES AND FEET note 3

OCCUPANCY GROUP	TYPE OF CONSTRUCTION														SPRINKLER REQUIREMENTS
	TYPE 1		TYPE 2				TYPE 3				TYPE 4				
	FIREPROOF		NONCOMBUSTIBLE				EXTERIOR MASONRY WALLS				FRAME				
	1A	1B	2A	2B	2C	(H.T.) MILL	3A	3B	3C	3C	4A	4B			
<b>A</b>	5 St 65' 16,800	3 St 40' 14,400	3 St 40' 11,400	2 St 30' 7,500	1 St 20' 4,800	2 St 30' 7,200	2 St 30' 6,600	2 St 30' 6,600	1 St 20' 4,800	1 St 20' 5,100	1 St 20' 5,100	NP	Note 7		
<b>B-1</b>	Note 2													Note 6 and 7	
<b>B-2</b>	Note 2													Note 6	
<b>C</b>	Note 2													Note 7	
<b>D-1</b>	Note 2													Note 7	
<b>D-2</b>	Note 2													Note 7	
<b>E</b>	Note 2													Note 7	
<b>F-1a</b>	Note 2													Note 7	
<b>F-1b</b>	Note 2													Note 7	
<b>F-2</b>	Note 2													Note 7	
<b>F-3</b>	Note 2													Note 7	
<b>F-4</b>	Note 2													Note 7	
<b>G</b>	Note 2													Note 7	
<b>H-1</b>	Note 2													Note 7	
<b>H-2</b>	Note 2													Note 7	
<b>L-1</b>	Note 2													Note 7	
<b>L-2</b>	Note 2													Note 7	
<b>L-3</b>	Note 2													Note 7	



**Notes on Table 2-2**

1. Church auditoriums of type 3-A construction may be erected to sixty-five (65) feet in height and of type 4 construction to forty-five (45) feet in height.
2. For exceptions to height and area limitations of high hazard use buildings, see article 4 governing the specific use. For other special fire-resistive requirements governing specific uses, see section 905.
3. In multi-story buildings, the limiting areas specified in section 221.2 table 2-2 shall be reduced as regulated by section 307.2.
4. For exception to area limitations for one-story school buildings of type 2, 3A and 3B construction, see section 309.1.1.
5. For accessory high hazard spaces within these occupancies refer to section 403.3 for sprinkler requirements.
6. Refer to section 415.6 for public garage sprinkler requirements.
7. Refer to sections 308 and 310 for sprinkler requirements.



# RS 2

## RS 2-1 Occupancy Classifications for Building and Zoning Codes

	Zoning Code Use Item	Building Code Occupancy Group
Advertising displays manufacture including billboards	68	D-2
Airport or other aircraft landing or service facility (See also: Helicopter rooftop landing facility)	67	not applicable
Amusement park, indoor	38	F-3
Outdoor	52	F-5
Animal		
Crematorium	—	B-2
Hospital, kennel, pound	49	E
Accessory enclosure for horses, cows, or similar animals other than pigs	75	B-1
Accessory enclosure for poultry, pigeons, rabbits or bees	76	—
Accessory enclosure for animals incidental to laboratory use	77	—
Apartments (see Residences)		
Appliances		
Manufacture	68	D-1
Sales	34 or 35	C
Arenas	54	F-1b indoor F-5 outdoor
Asphalt		
Processing and products manufacture	70	A
Athletic equipment		
Manufacture	68	D-1
Sales	34	C
Auditoriums		See Section 418.0
Commercial	38	F-1a with scenery, F-1b no scenery
Community centers (see also Colleges & universities; Schools)	29	F-1a or F-1b
Automobiles & other motor vehicles		
Gasoline Service Station	60	E, Section 416.0
Rental agency outdoors	51	—
Rental agency within a building	61	E
Repair	60	D-1, Section 417.0
Repair incidental to auto sales with limitations	82	D-1
Sales, outdoor	51	—
Sales within a building	36	C
Wrecking	57	D-2
(see also Parking garages; Parking lots)		
Washing	60	E

	Zoning Code Use Item	Building Code Occupancy Group
Awnings manufacture	68	D-1
Baked goods shop	34	C
Bakeries	68	D-1
Banks	41	E
Banquet halls	38	F-2, Section 419
Barber shops	43	E
in hotels, etc.	78	L-2
Beauty shops	43	E
Beverages		
bottling	68	D-2
manufacture		
alcoholic	70	D-1
less than 0.5% alcohol @ 60°	68	D-2
Bicycle		
manufacture	68	D-2
rental or repair conducted		
within a building	61	E
outdoors	51	—
sales	34	C
Billiard parlor	38	F-3, Section 419
Blacksmith shops	70	D-1
Blueprinting, etc., establishments	46	D-2
Boarding house	10	L-1
Boats or ships		
building or repair of boats less		
than one hundred feet long	68	D-1
building or repair of boats more		
than one hundred feet long	69	D-1
Bone distillation	70	D-1
Bowling alleys	38	F-3, Section 419.0
Broom or brush manufacture	68	D-1
Building materials		
outdoor storage of new materials	55	B-1 or B-2 no sales, C sales
outdoor storage of used materials	57	B-1 or B-2 no sales, C sales
wholesale business in roofed		
structures	54	C, B-1 or B-2 storage
Bus terminals or stations	62	D-1 (bus area)
		F-3 (passenger area),
yard for storing buses	64	—
Business schools or colleges	18	G
Camera & other photo equipment		
manufacture except film	68	D-2
sales	34 or 35	C
Canvas or canvas products		
manufacture or repair	68	D-1
Carpet & rug		
cleaning establishments	45	A or D-1 depending on nature of materials involved
manufacture or repair	68	D-1
Catering for outside consumption	46	D-2

	Zoning Code Use Item	Building Code Occupancy Group
Cemeteries		
crematory in cemetery	26c	B-2
extension of existing cemetery	26a	—
mausoleum, crypt, columbarium	26d	B-2
mortuary chapel in cemetery	26b	F-4, Section 419.0
Ceramic products manufacture including pottery, small glazed tile, & similar items	68	D-2
Charcoal, fuel, briquettes, or lampblack manufacture	70	D-1
Chemicals		
packaging	68	A, D-1, or D-2 depending on nature of materials involved
manufacture	70	A, D-1, or D-2 depending on nature of materials involved
Churches or other places of worship	21	F-4, Section 419
Circuses, temporary	—	F-1a, Section 418
Cleaning (see Drycleaning & Dyeing; Laundries; Automobiles—washing)		
Clothing		
manufacturing	68	A or D-1 depending on nature of materials involved
rental establishment	—	E
retail sales	34 or 35	C
tailoring, custom manufacture or repair (see also Feathers; Felt; Fur; Leather)	44	C
Clubs		
private	30	E without residence
nightclubs (see eating & drinking establishments)		
Coal, coke or tar products, manufacture	70	A
Colleges & universities		
classroom buildings	16	G
dormitories	11,12,13	L-2 depending on lot
fraternities or sororities	14	L-2
accessory use with limitations	79	—
Community centers	29	F-3, see Section 419
Convalescent homes (see nursing homes)		
Convents	21	L-3
Cosmetics or toiletries manufacture	68	D-1
Cotton ginning	68	A
Cotton wadding or lintens manufacture	68	A
Courthouses	41	E
Crematoriums		
animal	—	B-1
human	26c	B-1
Dance halls	38	F-2, Section 419

	Zoning Code Use Item	Building Code Occupancy Group
Dental offices (see Medical & dental)		
Department stores	35	C
Dormitories	11,12,13	L-2
Dressmaking shops, custom	44	D-1
Drinking places (see eating & drinking establishments)		
Drive-in restaurants	50	D-2
Drive-in theaters	52	F-5
Drug stores	34	C
Dry cleaning & dyeing establishment	45	A, D-1 or D-2 depending on solvent used, see Section 413
pick up & delivery station	43	C
shop	44	C sales, A, D-1, or D-2 work area
Dwellings (see residences)		
Eating or drinking places lunchrooms, restaurants, cafeterias, etc. primarily enclosed	37	F-2, Section 419
drive-in	50	D-2
with entertainment or dancing	38	F-2, Section 419
accessory to hotel, etc. primarily for occupants	78	F-2, Section 419
Electric power or steam generating plants	69	D-1
substation	31	D-2
Electrical appliances, bulbs, wiring supplies, etc. manufacture	68	D-2
sales	34 or 35	C
Electronic components & supplies manufacture or repair	68	D-2
Feathers curing, dyeing, washing or bulk processing	70	A
manufacturing exclusive of above	68	A
Felt curing, dyeing, washing or bulk processing	70	D-1
products manufacture, exclusive of above	68	D-1
Fertilizers, manufacture	70	D-1
Film, photographic manufacture	69	D-1
Storage and Studios	—	A, Section 409
Fire station garage	33	
dormitory		
Fish processing	69	D-1
Florist shops	34,35 or 51	C

	Zoning Code Use Item	Building Code Occupancy Group
Food		
product processing except meat & fish	68	D-1
retail sales	34 or 35	C
Fraternities or sororities (see Colleges & universities)		
Funeral establishments	47	F-3
Fur		
curing, dyeing, finishing, tanning products manufacture exclusive of above	70 68	A D-2
Garage (see parking Garage)		
Garbage incineration or reduction	70	D-1
Garden supplies, produce or flowers Outdoor sales	50	C
Gas		
Manufacture		
Two thousand cu. ft. a day or less	68	D-1
More than two thousand cu. ft. a day	70	A or D-1
Public utility stations for metering or regulating	31	D-1
Storage		
Ten thousand cu. ft. or less	56 or 68	A (more than 2500 cu. ft.) or B-1
More than ten thousand cu. ft.	57 or 70	A
Incidental to a lawful use	80	—
Gasoline service stations (see Automobiles)		
Gelatin manufacture	70	D-1
Generating plants, electric or steam	69	D-1
Gift shops	34 or 35	C
Glass products from previously manufactured	68	D-2
Glue manufacture	70	D-1
Golf		
Indoor courses or driving ranges	38	F-3, Section 419
Outdoor courses or driving ranges	52	
Gymnasiums	—	F-3, Section 419
Gypsum manufacture	70	D-2
Grain storage	54	A Section 411
Hair		
Curing, dyeing, washing, bulk processing	70	D-2
Product manufacture exclusive of above	68	D-2
Hardware		
Manufacture	69	D-2
Retail sales	34 or 35	C
Hat bodies manufacture	68	D-1

	Zoning Code Use Item	Building Code Occupancy Group
Helicopter landing facility, rooftop	66	D-1, structural, egress, & fire protection provisions rel. to building roofs (Section 415.1.4)
Home occupations	74	E
Homes for the aged	22	L-2
Hosiery manufacture	68	D-1
<b>Hospitals</b>		
Including convalescent, nursing or rest homes, and sanitoriums provided custodial care is not provided for drug addicts, alcoholics, or mentally ill or mentally deficient	22	H-2
For care of drug addicts, mentally ill or mentally deficient	23	H-1
Research or teaching laboratories	24	D-2
Limited accessory uses (see also Animals—Hospitals)	79	—
<b>Hotels</b>		
Apartment	15	L-2
Transient	15	L-1
Ice manufacture (dry or natural)	68	D-2
Ice skating rinks	38	F-3, Section 419
Incineration or reduction of garbage, offal, or dead animals	70	D-1
<b>Industrial uses (see specific items)</b>		
Without resulting noise, vibration, special danger, hazard, dust, smoke, fumes etc.	68 or 69	D-2
Other than above	70	A or D-1 depending on nature of materials involved
Ink or inked ribbon manufacture	68	D-1
<b>Kennels (see Animals)</b>		
<b>Jewelry</b>		
Costume, manufacture by metal stamping or extrusion	68	D-2
Junk, outdoor storage	58	not applicable
<b>Laboratories</b>		
Research laboratory not accessory to school or hospital	48	D-2
Scientific research or teaching laboratory, non-profit, accessory to school or hospital subject to limitations	24	D-2
Animal quarters incidental to educational or institutional use	77	—
<b>Laundries</b>		
Hand laundry	44	E
Self service; Pick up & delivery station of laundry or dry cleaner	43	E



	Zoning Code Use Item	Building Code Occupancy Group
Steam laundry, laundries without limitations	45	D-2
Leather		
Curing, dyeing, finishing or tanning	70	A or D-1
Product manufacture exclusive of above	68	D-1
Libraries, non profit	20	F-4 see Section 419
Linoleum or oilcloth manufacture	70	A
Liquor sales, package	34 or 35	C
Luggage manufacture	68	D-1
Lumber (see Wood)		
Manufacturing		
Depending upon product, processes, and resulting effects	68,69 or 70	A, D-1 or D-2
Manufacturing, assembly or packaging of products sold on the lot	81	—
Matches manufacture	70	A
Mattresses manufacture and renovation	68	A
Meat		
Markets	34 or 35	C
Poultry or rabbit slaughtering or packaging	68	D-1
Slaughtering or packaging	70	D-1
Medical & dental		
Offices not accessory to main use	39	E
(see also Laboratories; Orthopedic and medical appliances; Hospitals)		
Meeting halls		F-1b, see Section 418
Metals manufacture		
Furniture, cabinets, doors, fencing and like	68	D-1 or D-2
Products made by stamping or extrusion	68	D-2
Reduction, refining or smelting	70	D-2
Mobile homes	—	L-3, see Section 425
Monasteries	21	L-3
Motels	15	L-1, see Section 426
Motor freight stations (see trucking terminals)		
Museums		
Non profit	20	F-3, Section 419
Musical instruments manufacture		
Excluding pianos & organs	68	D-2
Including pianos & organs	68	D-1
Newspaper publishing	68	D-1
News stands	34	C
Novelty products manufacture	68	D-1

	Zoning Code Use Item	Building Code Occupancy Group
Nursing homes	22	H-2
Offices		
Building	41	E
Agency, real estate, insurance, etc.	40	E
Professional (accountant, architect, attorney, dentist, physician, etc.) or clinic not accessory to a main use	39	E
Wholesale office, display or sales space	42	E if storage restricted to samp
Oil cloth manufacture	70	A
Optical equipment or similar precision instruments manufacture	68	D-2
Orphanages	22	L-2
Orthopedic or medical appliances manufacture	68	D-1
Paint, turpentine or varnish Manufacture	70	A
Spraying booths		see Section 412
Paper products manufacture	68	D-1
Parish houses	29	F-3, Section 419
Park, public	27	not applicable
Parking garages		
Group 1 (for buses, trucks etc.)	59	B-1, Section 415
Group 2 (cars)	59	B-2, Section 415, open Section
Private	72	B-2, Section 414
Accessory for use of occupants, employees, customers, students, or visitors	72	—
Parking lots	58	see Section 424
Petroleum or petroleum products		
Refining	70	A
Storage		
Fifteen thousand gallons or less	56	A or B-1
More than fifteen thousand gallons	57	A
Pharmaceutical products manufacture	68	A or D-1 depending on nature of materials involved
Photographers studio	46	E
Plastics		
Products manufacture	68	A, see Section 408
Raw, manufacture	70	A, see Section 408
Playgrounds	27	F-5
Police Stations		
Cells	33	H-1
Offices	33	E
Pool rooms	38	F-3, Section 419
Post offices	41	E
Poultry or rabbit slaughtering	68	D-1

	Zoning Code Use Item	Building Code Occupancy Group
Printing		
Plant	46	D-1
Printing or newspaper publishing	68	D-1
Prisons & other correctional or detention institutions	25	H-1
Pumping station or substation, water or sewage	31	D-2
Radio		
Sales	34 or 35	C
Studios with audience	48	F-1a (scenery) F-1b (no scenery)
Studios without audience	48	E
Railroad		
Freight terminal	64	B-1
Passenger station	63	F-3
Recreation		
Center, indoor, public	27	F-3 Section 418
Center, outdoor, public	27	F-5
Center for profit (e.g. skating rink, bowling alley, billiard parlor)	38	F-3 Section 418
Community center building	29	F-3 Section 418
Private grounds, non profit	28	—
Rectories	21	L-3
Residences		
One-family detached	1	L-3
One-family each side of party wall semi-detached	2	L-3
Attached row house, one family between party walls	3	L-3
Two-family detached	4	L-3
Semi-detached, not more than two families each side of party wall	5	L-3
Attached row house, not more than two families each side of party wall	6	L-3
Apartment, apartment hotel (without accessory uses)	7	L-2
Temporary dwelling structure	9	L-3
Dwelling converted for more families	8	L-2 or L-3
Boarding or lodging house	10	L-1
Dormitory accessory to school or university depending upon lot	11,12,13	L-2
Fraternity or sorority	14	L-2
Hotel, motel, apartment hotel with accessory services	15	L-2
Accessory use in buildings with more than fifty dwelling units or hotels with more than fifty sleeping rooms (e.g. newsstand, barbershop, dining room, etc. with limitations)	78	L-2
Convents, monasteries, rectories	21	L-3

	Zoning Code Use Item	Building Code Occupancy Group
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Accessory dwelling for personnel required to reside on lot for proper operation of main use	83	L-3
Mobile homes	—	L-3, Section 425
Research laboratories (see Laboratories)		
Restaurant, lunch room, cafeteria or other establishment primarily for eating	37	F-2, Section 419
Retail business		
Department store, furniture store, general merchandise mart or other store serving needs of major portion of city, with limited combustible or flammable goods	35	C
Shop or store primarily serving local neighborhood, with limited combustible or flammable goods	34	C
Stores with combustible or flammable goods constituting a high hazard	34 or 35	C and A
Rubber		
Manufacture (natural or synthetic), including tires, tubes or similar products	70	D-1
Products (exclusive of processing) including washers, gloves, footwear, bathing caps and like	68	D-1
Salvage storage, outdoor	57	not applicable
Sanatoriums		
Not providing custodial care for drug addicts, alcoholics or mentally ill or mentally deficient	22	H-2
Providing care for above	23	H-1
Scenery construction	68	D-1
Schools		
Adult education center	29	G
Elementary or secondary	16	G
Day nursery, nursery school, kindergarten	17	G
Machine shop or other noisy activity accessory to school, college, etc.	19	D-2 and G
Trade or professional	18	G
Accessory uses subject to limitations (see also Colleges & universities)	79	—
Seminaries	16,11-13	G, L-2
Settlement houses	29	L-2
Sewage		
Disposal plant	70	D-1
Pumping station	31	D-2

	Zoning Code Use Item	Building Code Occupancy Group
Ship or boat building or repair		
Boats under one hundred feet long	68	D-1
Boats over one hundred feet long	69	D-1
Shoddy manufacture	68	A
Shoes		
Manufacture	68	D-1
Repair shop	43	D-1
Silverware, manufacture, plate or sterling	68	D-2
Size manufacture	68	D-1
Skating rinks	38	F-3, Section 419
Soaps & detergents		
Manufacturing, including fat rendering	70	A
Packaging	68	D-1
Solvent extracting	70	A
Sporting or athletic goods		
Manufacture	68	D-1
Stores, depending on area served	34 or 35	C
Stables, accessory use subject to limitations (see also: Animals)	75	B-1
Stadiums	52	F-5, Section 421
Statuary, mannequins, figurines or religious or church art goods, exclusive of foundry operations	68	D-2
Storage		
Outdoors, new building materials, equipment, etc.	55	—
Outdoors, second-hand building materials, junk, salvage items	57	—
Outdoors or in silos or hoppers of coal, coke or other solid fuel, or crushed stone, sand, etc.	56	B-1 or B-2
Warehouses	56	A, B-1 or B-2 depending on nature of materials involved
Wholesale business including accessory storage other than flammable liquids, gases and explosives, in roofed structures (see also: Wholesale)	54	B-1 or B-2 depending on nature of materials involved
Gases, fifteen thousand gallons or less of flammable liquids or ten thousand cu. ft. or less of gases.	56 or 68	A, Section 407
Gases, more than fifteen thousand gallons of flammable liquids, or more than ten thousand cu. ft. of gases.	57 or 70	A, Section 407
Stores (see: Retail stores; or specific items)		

	Zoning Code Use Item	Building Code Occupancy Group
Tailor shops, custom	44	E
Tanning (see Leather; Fur)		
Taxidermist shops	46	C
Telephone exchanges		
automatic	31	E
Non automatic	32	E
Television		
Sales	34 or 35	C
Studios	48	F-1a with scenery, Section 418 F-1b no scenery, Section 418 E no audience
Textiles		
Manufacture, including knit goods, yard goods, thread or cordage; spinning, weaving, dyeing and printing	68	D-1
Shoddy, manufacture	68	A
Theaters	38	F-1a with scenery, Section 418 F-1b no scenery motion picture, see Section 409
Tires, manufacture	70	D-1
Tobacco products manufacture including curing	68	D-1
Tools and hardware		
Manufacture	68	D-2
Sales	34 or 35	C
Toys		
Manufacture	68	D-1
Trailer park (see also Mobile homes)	54	—
Truck		
Repairs	60	D-2
Sales, outdoor	51	C
Sales, indoor	36	C
Trucking terminals & yards or motor freight yards	64	B-1
Turpentine manufacture	70	A
Warehouses	56	A, B-1 or B-2 depending on nature of materials involved
Waterfreight facilities, including docks, piers, accessories	65	—
Water pumping stations	31	D-2
Wax products manufacture	68	A
Wholesale		
Office, display or sales space	42	E storage restricted to samples
Storage, other than flammable liquids or gases and explosives, in roofed structures	54	B-1 or B-2 depending on nature of materials involved
Storage of coal, coke or other solid fuel, crushed stone, sand		

**Zoning Code  
Use Item**

**Building Code  
Occupancy Group**

or similar materials, gases,  
flammable liquids

56 or 57

A, B-1 or B-2 depending on nature  
of materials involved

Storage outdoors of new building  
materials, metals or like

55

—

Window shades manufacture

68

D-1

Wood

Distillation

70

D-1

Products manufacture, including  
furniture, boxes, crates,  
barrels, baskets, pencils and  
the like

68

D-1

Pulp or fiber reduction or  
processing, including paper mill  
operation

69

D-1

Sales, retail

35

C

Sawmills

68

D-1

Storage outdoors of new building  
materials

55

—

Storage outdoors of second hand  
building materials

57

—

Wool scouring or pulling

70

D-1

Umbrellas, manufacture

68

D-1

Upholstering

68

D-1

Vehicles

Manufacture, children's  
including baby carriages, scooters,  
wagons, bicycles and like

68

D-1

(see also Automobiles; Parking; Trucks)

Venetian blinds, window shades &  
awnings, manufacture

68

A or D-1 depending on nature  
of materials involved





**GENERAL BUILDING LIMITATIONS**

300.0	Scope	309.0	Unlimited Areas
301.0	Fire District Subdivisions	310.0	Height Exceptions
302.0	General Fire Zone Provisions	311.0	Street Encroachments
303.0	Restrictions of First Fire Zone	312.0	Permissible Projections Beyond Street lines
304.0	Restrictions of Second Fire Zone	313.0	Permissible Yard and Court Encroachments
305.0	Restrictions Outside Fire Zones	314.0	Special and Temporary Projections
306.0	Existing Buildings	315.0	Awnings and Canopies
307.0	General Area and Height Limitations	316.0	Accessibility to Fire Fighting
308.0	Area Exceptions	RS 3	Reference Standards

**SECTION 300.0. SCOPE**

The provisions of this article shall control the division of the City of Boston into fire districts and the general limitations of height and area of all buildings hereafter erected, and extensions to existing buildings hereafter altered or enlarged as affected by the fire and life hazard incident to type of construction, occupancy group, density of development, exterior exposure and accessibility of buildings and structures to firefighting facilities and equipment.

**300.1. Standards.**—The provision of reference standard RS 3 shall be part of this article.

**300.2. Definitions.**—For definitions to be used in the interpretation of this article, see section 201.

**SECTION 301.0. FIRE DISTRICT SUBDIVISIONS**

For the purpose of control of occupancy and construction of building and structures, there shall be established in the City of Boston limiting districts designated the first fire zone, the second fire zone and outside the fire zones.

**301.1. First Fire Zone.**—The boundaries of the first fire zone shall be those described in reference standard RS 3-1.

**301.2. Second Fire Zone.**—The boundaries of the second fire zone shall be those described in reference standard RS 3-2.

**301.3. Outside Fire Zones.**—All other areas not included in First and Second Fire Zones.

## **SECTION 302.0. GENERAL FIRE ZONE PROVISIONS**

**302.1. Changes in Zones.**—The city council of the City of Boston may by ordinance from time to time extend either fire zone and re-establish its boundaries.

**302.2. Overlapping Zones.**—A building or structure located in more than one (1) fire zone shall be deemed to be in that one of the zones which contain the major part of the building area; and in the event of equal distribution in two (2) or more zones, the limitations of the most restricted zone shall apply.

### **302.3. Limitations.**

**302.3.1.** No buildings in those combinations of construction classes and occupancy groups prohibited by section 221.2 table 2-2, shall neither be erected inside the first and second fire zones nor shall be moved from outside to inside the fire zones nor from one lot to another inside the fire zones.

**302.3.2. High Hazard Occupancies.**—Except as specifically approved by the building official, all buildings of high hazard use (occupancy group A) shall be prohibited from location in the first fire zone. Paint spray, drying rooms and rooms for similar incidental uses not exceeding one thousand (1000) square feet in area in industrial buildings shall be permitted when enclosed in fireresistive construction as specified in article 4 for special uses and occupancies and when separated by fire divisions of the required fireresistance specified in this code.

**302.3.3. Protected Exteriors.**—Within the fire zones, all buildings of type 2 construction shall have those exterior walls, which are located within eleven (11) feet of interior lot lines or other buildings on the same lot constructed of not less than two (2) hour fireresistance for occupancy group A nor less than three-quarter (3/4) hour fireresistance for all other occupancies.

**302.3.4.** No building inside the fire zones may be increased in area or height to exceed the limitations of section 221.2, table 2-2.

**302.4.** Deleted.

**302.5. Frame Construction.**—No building of frame construction (type 4) shall be erected within the fire districts nor shall such building or structure be moved from without to within, or from one (1) lot to another within the fire districts, except as provided

in sections 303 and 304; and no building of otherwise lawful construction shall be extended in height or area within the fire districts by frame construction; except that one- and two-family frame dwellings may be extended in area by not more than three hundred (300) square feet and to a height of not more than two and one-half (2-1/2) stories nor more than thirty-five (35) feet when permitted by the building official.

**302.6. Roof Coverings.**—All roof coverings shall be constructed of Class A, Class B or Class C roofings, complying with the provisions of article 9.

## **SECTION 303.0. RESTRICTIONS OF FIRST FIRE ZONE**

**303.1. General.**—All buildings and structures, and all additions to existing buildings and structures, hereafter erected within the boundaries of First Fire Zone shall be of fireproof (type 1), protected noncombustible (type 2-A and 2-B), heavy timber (type 3-A), or ordinary protected (type 3-B) construction as defined in article 2 and regulated in section 221.1, table 2-1; and shall be constructed within the height and area limitations of section 221.2, table 2-2; except as herein provided.

Open parking structures may be constructed as permitted under section 905.2.

### **303.2. Exemptions.**

**303.2.1. Fences.**—Fences not over six (6) feet high may be erected of wood or other combustible material.

**303.2.2. Storm Enclosures, Bay Windows, Etc.**—Storm enclosures may be erected of frame construction not more than ten (10) feet in height and not more than three (3) feet wider than the entrance doors which they serve; provided they do not project more than six (6) feet beyond the building line.

Bay windows and similar appendages may be constructed of combustible materials in accordance with the provisions of section 926.3.2.

### **303.2.3. Accessory Buildings.**

- a. **Outbuildings and Parking Lot Offices.**—Outbuildings and parking lot offices not more than ten (10) feet in height and one hundred (100) square feet in area may be erected of frame (type 4) construction when accessory to one- or two-family dwellings on the same lot or accessory to a lot approved for motor vehicle parking, when located not less than six (6) feet from the lot line or any building.

- b. Greenhouses. — Greenhouses may be constructed of combustible materials when accessory to a one- or two-family dwelling on the same lot and when located at least 6 ft. from any lot line or building.
- c. Private Garages. — Private garages not more than one (1) story nor more than fifteen (15) feet in height when accessory to a one- or two-family dwelling may be erected of protected frame (type 4-A) construction not more than seven hundred and fifty (750) square feet in area, or of frame (type 4-B) construction not more than five hundred (500) square feet in area, when located not less than six (6) feet from interior lot lines or any building.

**303.2.4. Temporary Structures.** — Temporary structures to be used in connection with construction work and temporary reviewing stands, frame-works and tents, as are customarily used exclusively for outdoor carnivals, lawn parties or like activities, may be erected in either fire zone and of any type of construction, subject to the approval of the building official, and to such conditions and for such time as he may in each case specify.

**303.2.5. Bins, Tanks and Towers.** — Coal and material bins, water towers, tank structures, and trestles may be constructed of wood planking and timbers of dimensions not less than as required for type 3A construction when not over thirty-five (35) feet high and having an exterior separation of at least thirty (30) feet.

**303.2.6. Bulk Storage Buildings and Buildings on Wharves.** — Buildings not over twenty-seven (27) feet high on wharves and buildings for the storage and handling of coal or grain in bulk of type 2C, 4A or 4B construction if the exterior thereof is covered with slate, tin, sheet metal or other equally fireresistive construction, erected with the approval of the building official and subject to such conditions as he may in each case specify.

**303.2.7. Motor Fuel Service Stations.** — Gasoline service stations, and structures of similar business uses, not including high hazard uses, may be erected of unprotected noncombustible (type 2-C) construction within the height and area limits of occupancy group E of section 221.2, table 2-2 provided they are located not less than eleven (11) feet from the lot line or any building.

**303.2.8. Bus and Passenger Terminals.** — Roofs over parking lots, bus and passenger terminals may be erected one (1) story and

not over twenty (20) feet in height and not more than eleven thousand (11,000) square feet in area of noncombustible (type 2-C) construction or of heavy timber mill (type 3-A) construction.

**303.2.9. Signs.**—Ground signs, wall signs, roof signs, and temporary signs may be constructed of combustible materials within the limitations established in article 14.

**303.2.10. Store Fronts.**—Wood veneers of one (1) inch nominal thickness or exterior grade plywood not less than three-eighths (3/8) inch thick or exterior grade particle board not less than three-eighths (3/8) inch thick may be used on store fronts when facing public streets; provided the veneer does not exceed one (1) story in height and is applied to noncombustible backing or is furred not to exceed one and five eighths (1-5/8) inches and is firestopped in accordance with sections 877 and 921.2.

## **SECTION 304.0. RESTRICTIONS OF SECOND FIRE ZONE**

**304.1. General.**—All buildings and structures hereafter erected within the boundaries of Second Fire Zone shall be fireproof (type 1), noncombustible (type 2), heavy timber (type 3-A) or ordinary protected (type 3-B) construction as defined in article 2 and regulated by section 221.1 table 2-1, and shall be constructed within the height and area limitations of section 221.2 table 2-2; except that all the variations permitted in the First Fire Zone shall apply to permissible construction in the Second Fire Zone with the following additional exceptions:

### **304.2. Exceptions.**

**304.2.1. Dwellings.**—One- and two-family dwellings (occupancy group L-3) may be erected or enlarged of protected frame (type 4-A) construction when not less than three (3) feet from interior lot lines and of unprotected frame (type 4B) construction when not less than six (6) feet from interior lot lines within the height and area limitations of section 221.2 table 2-2 and where the area of each does not exceed sixty (60) per cent of the area of the lot on which it is located. The roof of said buildings shall have roof covering of class a, b or c roofings complying with the provisions of article 9.

**304.2.2. Garages.**—Buildings of type 2-C construction may be erected or enlarged for use as garages in the second fire zone providing they are equipped with fire windows and are not within two (2) feet of a lot line or within five (5) feet of a building of type 4-B construction and the height does not exceed

one (1) story and the area six hundred (600) square feet and the capacity two (2) cars.

**304.2.3. Type 2-C Construction.**—Buildings of Type 2-C construction for other occupancies may be erected providing the location and the occupancy are approved by the building official.

**304.2.4. Boat Houses.**—Boat houses not more than two (2) stories nor more than thirty (30) feet in height nor more than four thousand (4000) square feet in area may be erected of frame (type 4-B) construction subject to the approval of the building official.

**304.2.5. Verandas.**—Verandas, balconies, entrance porticoes and similar appurtenant structures on dwellings, not exceeding ten (10) feet in depth nor projecting more than two (2) feet above the second story floor beams may be erected of frame (type 4-B) construction provided they do not extend nearer than five (5) feet to the lot line. When connected to a similar structure of an adjoining building, they shall be separated therefrom by walls of two (2) hour fireresistance.

**304.2.6. Exterior Trim.**—Wood cornices and half timbering may be erected on residence (occupancy group L) and business (occupancy group C, D, and E) buildings.

## **SECTION 305.0. RESTRICTIONS OUTSIDE FIRE ZONES**

Outside the fire zones, all types of construction except as herein specifically prohibited, or for which special approval is required in connection with high hazard uses and occupancies in article 4, shall be permitted within the height and area limitations of section 221.2, table 2-2.

**305.1. Lot Line Separation.**—In frame construction an exterior wall erected less than six (6) feet from its adjacent lot line shall be of three-quarter (3/4) hour fireresistive construction, including opening protectives except store fronts; and window and door openings in one (1) and two (2) family dwellings, but in no case shall such wall be located less than three (3) feet from interior lot lines.

## **SECTION 306.0. EXISTING BUILDINGS**

**306.1. Alterations.**

**306.1.1. Limitations.**—Nothing in these provisions shall be deemed to prohibit alterations within the limitations of article

1 Part II provided no unlawful change of occupancy is involved.

**306.1.2. Minor Changes.**—Changes, alterations or repairs to the interior of a building and to the front facing a street or other public space may be permitted provided such changes in the opinion of the building official do not increase the size, or the fire hazard of the building, or endanger the public safety and are not specifically prohibited by this code.

**306.1.3. Existing Projections.**—No change or enlargement shall be made to an existing part of a building now projecting beyond the street lot line or building line where such is established by law, except in conformity to the provisions of section 312 governing new construction.

**306.2. Increase in Height and Area.**—It shall be unlawful to increase the height or area of an existing building or structure unless it is of a type of construction permitted for new buildings of the increased height and area and occupancy group within the fire district in which it is located and as regulated by section 221.2, table 2-2.

**306.3. Existing Excessive Area.**—Any building heretofore lawfully approved which exceeds the maximum allowable area specified in section 221.2 table 2-2 may be extended if the addition is separated from the existing building by a type A fire division meeting the requirements of article 9 and section 221.1 table 2-1 and the additional area does not exceed the limits of section 221.2 table 2-2 for the specific occupancy group and type of construction.

## **SECTION 307.0. GENERAL AREA AND HEIGHT LIMITATIONS**

No building or building section shall be constructed or altered so as to exceed the area limits and the height limits established by section 221.2 table 2-2 based on the occupancy group classification of the building or building section, except as these may be specifically modified by other provisions of this code, or as further restricted by the City of Boston Zoning Code.

**307.1. Area Limit.**—The area limitations specified in section 221.2 table 2-2 shall apply to all buildings fronting on a street or public space not less than thirty (30) feet in width accessible to a public street.

**307.2. Height Limit.**—The height of all buildings and structures shall be controlled as follows:

**307.2.1.** The height in feet and number of stories specified in section 221.2 table 2-2 shall apply to all buildings and to all separate parts of a building enclosed within lawful fire walls complying with the provisions of article 9.

**307.2.2.** Buildings two (2) stories in height when permitted by section 221.2 table 2-2 may be built to the same area limits provided in section 221.2 table 2-2 for one (1) story buildings. In buildings over two (2) stories in height when permitted by section 221.2 table 2-2, the area limits of section 221.2 table 2-2 for one (1) story buildings shall be reduced for each story of height over two (2) stories in all occupancy groups as herein specified:

1-1/2 hour protected noncombustible construction	
(Type 2-A) . . . . .	1/20
All other types of construction	
(Types 2-B, 2-C, 3-A, 3-B, 3-C and 4-A)	
3 Story . . . . .	1/5
Over 3 Story . . . . .	1/10

**307.3. Measurement of Height.**—In determining the height of any part of a building for the purposes of this section, the grade of the ground from which the height of the building is measured is defined in section 201.

## **SECTION 308.0. AREA EXCEPTIONS**

The provisions of this section shall modify the area of limits of section 221.2 table 2-2 as herein specified.

**308.1. Street Frontage Increase.**—When a building or structure has more than twenty-five (25) per cent of the building perimeter fronting on a street or other accessible unoccupied space not less than thirty (30) feet in width leading to a street, the tabular areas may be increased two (2) per cent for each one (1) per cent of such excess frontage.

**308.2. Sprinkler Increase.**—When a building of low hazard or moderate hazard storage, or mercantile, industrial, business, school or assembly (occupancy group F-4) occupancy group is equipped with an approved one-source automatic sprinkler system, unless such sprinkler system is required by the provisions herein or of article 4 or article 12 for structures of special use and occupancy, the tabular areas may be increased by two hundred (200) per cent for one (1) story buildings and one hundred (100) per cent for buildings more than one (1) story in height.



**308.2.1. Area Sprinkler Requirements.**

- a. A one-source sprinkler system shall be provided on all floors of mercantile and industrial buildings (occupancy group C and D) which are more than twenty thousand (20,000) square feet in area on any floor above or below the grade floor when of types 1A, 1B or 2A construction or more than ten thousand (10,000) square feet when of types 2B or 3A construction, or more than seven thousand five hundred (7,500) square feet when of types 2C, 3B and 3C construction and more than six thousand (6,000) square feet when of type 4A construction. This provision shall not apply to buildings of one (1) story without basement.
- b. All buildings and structures used for the manufacture, sale or storage of combustible materials and products (occupancy groups A and B1) shall be equipped with an approved automatic sprinkler system when in excess of the heights and areas for each construction type as specified in section 310.2.1.

**308.3. Maximum Total Area.**—The maximum total area under the combined provisions of section 308.1 and 308.2 shall not exceed three and one-half (3-1/2) times the tabular area in section 221.2 table 2-2.

**SECTION 309.0. UNLIMITED AREAS**

**309.1. One-Story Buildings.**—In other than frame construction, the area of all buildings of assembly (occupancy group F-3), business, industrial, mercantile and storage occupancy groups not including high hazard uses, which do not exceed one (1) story or eighty-five (85) feet in height shall not be limited outside the fire limits; provided the exitway facilities comply with the provisions of section 604, an automatic sprinkler system is provided complying with the provisions of section 1213.1 and the building is isolated as specified in section 309.2, except that a sprinkler system shall not be required for buildings of type 2 or type 3A construction used exclusively for storage of non-combustible materials not packed or crated in combustible materials or as exempt by section 206.3 for special industrial uses.

**309.1.1. School Buildings.**—Outside the fire zones, one-story school buildings of type 2, 3A and 3B construction may be

unlimited in area when a direct exitway to the outside of the building is provided from each classroom and the building is equipped with an approved automatic sprinkler system throughout. A fire separation shall be provided on all sides of such buildings as specified in section 309.2.

**309.2. Fire Separation Distance.**—The minimum fire separation distance on all sides of one-story buildings of unlimited area shall be determined by the type of construction as herein specified:

Fireproof construction (types 1A and 1B) . . . . .	.30 feet
Noncombustible, 1-1/2 hour protected (type 2A) . . .	.30 feet
Noncombustible, 3/4 hour protected (type 2B) . . . .	.40 feet
Noncombustible, unprotected (type 2C) . . . . .	.50 feet
Exterior masonry, heavy timber (type 3A) . . . . .	.40 feet
Exterior masonry, protected ordinary (type 3B) . . .	.40 feet
Exterior masonry, unprotected ordinary (type 3C) . .	.50 feet

## **SECTION 310.0. HEIGHT EXCEPTIONS**

**310.1. Roof Structures.**—In applying the provision of this code governing height limits, the following appurtenant structures shall not be included in the height of the building unless the aggregate area of such structures including penthouses exceeds thirty-three and one-third (33-1/3) per cent of the area of the roof of the building upon which they are erected.

- a. Roof tanks and their supports.
- b. Ventilating, air conditioning, and similar building service equipment.
- c. Roof structures, bulkheads, and penthouses.
- d. Chimneys.
- e. Parapet walls four (4) feet or less in height.
- f. Flag poles and weather vanes.

**310.2. Automatic Sprinklers.**—Except in buildings where automatic sprinkler equipment is a requirement herein or of article 4 or article 12 for special uses or occupancies, all structures of fireproof (type 1), noncombustible (type 2), and exterior masonry wall (type 3) construction designed for business, industrial, mercantile, low or moderate hazard storage uses may be erected one (1) story or twenty (20) feet higher than specified in section 221.2 table 2-2 when equipped with an approved one-source automatic sprinkler system.

**310.2.1. Sprinkler Height and Area Requirements.**—All buildings

and structures used for the manufacture, sale or storage of combustible materials and products (occupancy groups A and B-1) shall be equipped with an approved automatic sprinkler system when more than three (3) stories or forty (40) feet in height and more than ten thousand (10,000) square feet in area of fireproof (type 1A or 1-B) construction; when more than three (3) stories or forty (40) feet in height and seven thousand five hundred (7,500) square feet in area of non-combustible (type 2-A) construction; when more than two (2) stories or thirty (30) feet in height and six thousand (6,000) square feet in area of protected noncombustible (type 2-B) or heavy mill (type 3-A) construction; when more than one (1) story in height and three thousand (3,000) square feet in area of ordinary (type 3-C) or protected frame (type 4-A) construction; and in every usable or occupiable cellar or story with ceiling located less than six (6) feet above grade and more than three thousand (3000) square feet in area.

## SECTION 311.0. STREET ENCROACHMENTS

Except as herein provided, and subject to approval of the Public Improvements Commission and Public Works Department as required, no part of any building hereafter erected and no additions to an existing building heretofore erected shall project beyond the street lines or beyond the building line when such line is established by the zoning law or any other statute controlling building construction.

**311.1. Projections Below Grade.**—Subject to the provisions of this section the following projections may be constructed below grade to project beyond the street line:

**311.1.1. Footings.**—Exterior wall and column footings may be constructed to go beyond the street line not more than twelve (12) inches provided that the top of the footing is not less than eight (8) feet below the ground or sidewalk level.

**311.1.2. Foundation Walls.**—Foundation walls required to support permitted projections may be constructed to project not more than the permitted projection beyond the street line.

**311.1.3. Vaults.**—Where permitted approved vaults may be constructed to project beyond the street line but not beyond the curb line. Vault covers shall be set flush with the sidewalk and surfaced with non-skid material.

**311.1.4. Tunnels Between Buildings.**—Tunnels connecting buildings, and projecting beyond street lines, may be constructed subject to the approval of the building official. Such tunnels shall comply with the provisions of this code and other applicable laws and regulations.

**311.1.5. Areaways.**—Areaways shall not project beyond the street lot line more than four (4) feet; provided that every such areaway shall be covered over at the street grade by an approved grating of metal or other noncombustible material.

**311.2. Projections Above Grade.**—All projections hereafter permitted beyond the street lot line or the building line above grade shall be so constructed as to conform to the provisions of sections 311.4 and 312.

**311.3. Projections Necessary for Safety.**—In any specific application, the building official may designate by approved rules such architectural features and accessories which are deemed desirable or necessary for the safety of the public and the extent to which they may project beyond the street lot line or the building line where such is established by statute, subject to all provisions and restrictions that may be otherwise prescribed by law, ordinance or rule of the authorities having jurisdiction over streets or public spaces.

**311.4. Permission Revocable.**—Any permission, expressed or implied, permitting the construction of projections within the area of the street under the provisions of this article shall be revocable by the City of Boston Council, except footings as permitted under section 311.1.1.

**311.4.1.** All projections permitted beyond the street line by the provisions of this article shall be constructed so that they may be removed at any time without endangering the structural safety or fire safety of the building except that footings as permitted under section 311.1.1 need not be removable.

**311.5. Existing Projections.**—Any part of a building that projects beyond a street line on the date of the adoption of this code may be maintained as constructed until its removal is directed by the mayor and city council.

**311.5.1. Alterations.**—Approved alterations to existing projections beyond the street line may be permitted in whole or in part, provided that such alterations conform with the requirements of this section.

## SECTION 312.0. PERMISSIBLE PROJECTIONS BEYOND STREET LINES

Subject to such provisions as may be otherwise prescribed by law or ordinance, or by rule or regulation of a City of Boston authority having jurisdiction over streets, highways, and public spaces, and subject to approval of the Public Improvements Commission and Public Works Department as required, the following projections shall be permitted beyond the street lot line or the building line, as the case may be.

**312.1. Fixed Projections.**—Fixed projections are those elements listed below, generally of an architectural character, that form an integral part of the building facade. The aggregate area of all fixed projections constructed to extend beyond the street line shall not exceed ten (10) square feet within any one hundred (100) square feet of wall area, except that a veneer may be applied to the entire facade of a building erected before the effective date of this code, if such veneer does not project more than four (4) inches beyond the street line. The area of any fixed projection shall be measured at that vertical plane, parallel to the wall, in which the area of the projection is greatest. This plane of measurement may be at the street line, the line of maximum projection, or any point in between.

**312.1.1. Entrance Details.**—Entrance details, including steps, and doors when fully open, may be constructed to project beyond the street line not more than twelve (12) inches. Entrance steps that project beyond the street line shall be guarded at each end by railings or cheek pieces at least three (3) ft. high or by other members of the entrance detail providing equivalent protection.

**312.1.2. Architectural Details.**—Details such as cornices, eaves, bases, sills, headers, belt course, opening frames, sun control devices, rustications, applied ornament or sculpture, grilles, windows when full open, air conditioning units, and other similar elements may be constructed to project not more than four (4) in. beyond the street line when less than ten (10) ft. above the ground or sidewalk level, and not more than ten (10) in. beyond the street line when more than ten (10) ft. above the ground or sidewalk level.

**312.1.3. Balconies.**—Balconies, including railings and supporting brackets, no parts of which are less than ten (10) ft. above the ground or sidewalk level, may be constructed to project not more

than twenty-two (22) in. beyond the street line. When permitted by article 6 and subject to approval of the building official, fire escapes that are part of a required exitway may be constructed to project not more than four (4) ft. six (6) in. beyond the street line provided no part, including any movable ladder or stair, is lower than ten (10) ft. above the ground or sidewalk level when not in use.

**312.1.4. Cornices or Roof Eaves.**—Main cornices or roof eaves located at least twelve (12) feet above the curb level shall project not more than three (3) feet.

**312.1.5. Oriel Windows.**—Oriel windows with the lowest portion at least ten (10) feet above the curb level shall project not more than two and one-half (2-1/2) feet.

**312.1.6. Marquees.**—For the purpose of this section a marquee shall include any object or decoration attached to or a part of said marquee.

- a. Marquees may be erected on public buildings, theaters, hotels, terminals, large department stores, supermarkets, multi-family dwellings, and similar buildings of an essentially public nature.
- b. **Projection and Clearance.**—The horizontal clearance between a marquee and the curb line shall be not less than two (2) feet. A marquee projecting more than two-thirds (2/3) of the distance from the property line to the curb line shall be not less than ten (10) feet above the ground or pavement below.
- c. **Thickness.**—The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not exceed three (3) feet when the marquee projects more than two-thirds (2/3) of the distance from the property line to the curb line and shall not exceed nine (9) feet when the marquee is less than two-thirds (2/3) of the distance from the property line to the curb line.
- d. **Roof Construction.**—The roof or any part thereof may be a skylight of approved plastics, or wired glass not less than one-fourth (1/4) inch thick with no single pane more than eighteen (18) inches wide. Every roof and skylight of a marquee shall be sloped to downspouts which shall conduct any drainage from the marquee in a manner not to spill over the sidewalk.
- e. **Construction.**—A marquee shall be supported entirely

from the building and constructed of noncombustible material. Marquees shall be designed and constructed to withstand wind or other lateral loads and live loads as required in article 7 of this code. Structural members shall be protected to prevent deterioration as required by article 8.

- f. **Location Prohibited.**—Every marquee shall be so located as not to interfere with the operation of any exterior standpipe or to obstruct the clear passage of stairways or exitways from the building or the installation or maintenance of street lighting.

**312.1.7. Light Fixtures.**—Light fixtures that are supported entirely from the building may be constructed to project not more than two (2) ft. beyond the street line, provided no part of the fixture is less than eight (8) ft. above the ground or sidewalk level.

**312.1.8. Flagpoles.**—Flagpoles that are supported entirely from the building may be constructed to project not more than eighteen (18) ft. beyond the street line, but not closer than two (2) ft. to the curb line, provided that no part of the flagpole is less than fifteen (15) ft. above the ground or sidewalk level.

**312.1.9. Signs.**

- a. Wall signs may be constructed to project not more than twelve (12) in. beyond the street line when conforming to the requirements of article 14.
- b. Projecting signs may be constructed to project not more than ten (10) ft. beyond the street line, but not closer than two (2) ft. to the curb line, when conforming to the requirements of article 14, and provided that no part of the sign is less than ten (10) ft. above the ground or sidewalk level.

**312.2. Awnings.**—Awnings supported entirely from the building may be constructed to project beyond the street line as follows:

**312.2.1. Store Front Awnings.**—Store front awnings may be constructed to project beyond the street line not more than eight (8) ft., provided no part of the awning is less than eight (8) ft. above the ground or sidewalk level, except for a flexible valance, which may be not less than seven (7) ft. above the ground or sidewalk level, and provided that the awning box or cover does not project more than twelve (12) in. They shall be equipped with a mechanism or device for raising and holding

the awning in a retracted or closed position against the face of the building.

**312.2.2. Drop Awnings.**—Awnings over windows or doors may be constructed to project beyond the street line not more than five (5) feet provided that no part of the awning is less than eight (8) feet above the ground or sidewalk level.

**312.2.3. Construction.**—Subject to the provisions of section 315, awnings shall be constructed of a noncombustible frame covered with flameproofed canvas or cloth, slow-burning plastic, sheet metal, or other equivalent material.

## **SECTION 313.0. PERMISSIBLE YARD AND COURT ENCROACHMENTS**

No part of any building or structure shall extend into side courts, inner courts or yards required for light and ventilation of habitable and occupiable rooms by the provisions of article 5, or of the zoning law or other statutes controlling building construction, except as hereinafter provided; but in no case shall the encroachment exceed twenty (20) per cent of the legal area of yard or court required for light and ventilation purposes.

**313.1.** Roof eaves may project not more than three (3) feet beyond the face of the walls or other vertical planes forming the bounds of the minimum required legal yard or court area.

**313.2. Steps and Architectural Features.**—Steps, window sills, belt courses and similar architectural features, rain leaders and chimneys may project not more than two (2) feet beyond the face of the walls or other vertical planes forming the bounds of the minimum required legal yard or court area.

**313.3. Exterior Stairways and Fire Escapes.**—Outside stairways, fire tower balconies, fire escapes or other required means of egress may project not more than four (4) feet beyond the face of the walls or other vertical planes forming the bounds of the minimum required legal yard or court area.

## **SECTION 314.0. SPECIAL AND TEMPORARY PROJECTION**

Special and temporary projections shall be subject to the approval of the Public Improvements Commission and Public Works Department as required and the provisions of this section.



**314.1. Alley Projections.**—The permissible projections beyond street lot lines shall apply in general to building projections into alleyways except as may be modified by the building official, ordinance, or by special deed restriction.

**314.2. Special Permits.**—When authorized by special permit, vestibules and storm doors may be erected for periods of time not exceeding seven (7) months in any one year, and shall project not more than three (3) feet nor more than one-fourth (1/4) the width of the sidewalk beyond the street lot line. Temporary entrance awnings may be erected with a minimum clearance of seven (7) feet to the lowest portions of the hood or awning when supported on removable steel or other approved noncombustible supports.

## **SECTION 315.0. AWNINGS AND CANOPIES**

Awnings and canopies shall be subject to the approval of the Public Improvements Commission and Public Works Department as required and the provisions of this section.

**315.1. Permit.**—A permit shall be obtained from the building official for the erection, repair or replacement of any fixed awning, canopy or hood except as provided in section 315.1.1, and for any retractable awning located at the first story level and extending over the public street or over any portion of a court or yard beside a building serving as a passage from a required exitway to a public street.

**315.1.1. Exemption from Permit.**—No permit shall be required for the erection, repair or replacement of fixed or retractable awnings installed on one- and two-family dwellings, unless they project over public property, or for retractable awnings installed above the first story or when the awning does not project over the public street or over any court or yard serving as a passage from a required exitway to a public street.

**315.2. Special Applications of Awnings.**—Except as may be limited by section 312.2, fixed awnings supported in whole or part by members resting on the ground and used for patio covers, car ports, summer houses or other similar uses shall comply with the requirements of section 315.4 for design and structure. Such structures shall be braced as required to provide rigidity.

**315.3. Canopies.**—Canopies shall be constructed of a metal framework, with an approved covering, attached to the building

at the inner end and supported at the outer end by not more than two (2) stanchions with braces anchored in an approved manner and placed not less than two (2) feet in from the curb line. The horizontal portion of the framework shall be not less than eight (8) feet nor more than twelve (12) feet above the sidewalk and the clearance between the covering or valance and the sidewalk shall be not less than seven (7) feet. The width of canopies shall not exceed eight (8) feet.

**315.4. Design and Construction.**—Fixed awnings, canopies and similar structures shall be designed and constructed to withstand wind or other lateral loads and live loads as required by article 7 of this code. With due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration.

## **SECTION 316.0. ACCESSIBILITY TO FIRE FIGHTING**

**316.1. Frontage.**—Every building, exclusive of accessory buildings, shall have at least eight (8) percent of the total perimeter of the building fronting directly upon a street or frontage space. For the purposes of this section, building perimeter shall be measured at that story having the maximum enclosed floor area.

**316.2. Building Access.**—Provisions shall be made for access by the fire department to every building as follows:

**316.2.1. Above Grade.**—Access shall be provided directly from the outdoors to each story below a height of 100 ft. except to the first story or ground floor, by at least one (1) window or readily identifiable access panel within each fifty (50) feet or fraction thereof of horizontal length of every wall that fronts on a street or frontage space. Windows shall be openable or breakable from both the inside and the outside, and shall have a height when open of at least forty-eight (48) inches and a width of at least thirty-six (36) inches. Panels shall be openable from both the inside and outside and shall have a height when open of forty-eight (48) inches and a width of at least thirty-two (32) inches. The sill of the window or panel shall not be higher than thirty-six (36) inches above the inside floor.

**316.2.2. Below Grade.**—Access shall be provided directly from the outdoors to the first basement or cellar story below grade, except in one- and two-family dwellings, within each one hundred (100) feet or fraction thereof of horizontal length of

every wall that fronts on a street or frontage space. Such access shall be by stairs, doors, windows or other means that provide an opening forty-eight (48) inches high and thirty-two (32) inches wide, the sill of which shall not be higher than thirty-six (36) inches above the inside floor. If an areaway is used to provide below grade access, the minimum horizontal dimension shall be at least one-third ( $1/3$ ) the depth of the areaway or six (6) feet whichever is less.

- a. Access to additional stories below grade is not mandatory since they are required to be sprinklered as provided in section 1213.

**316.2.3. Signs.**—Where wall signs are erected to cover doors or windows of existing buildings, access panels shall be provided as necessary to comply with the requirements of sections 316.2.1. and 316.2.2 above.

**316.2.4. Location.**—Wherever practicable, one access opening in each story shall provide access to a stairway, or where there is no stairway at the exterior wall, one access opening in each story shall be located as close as practicable to a stairway.

**316.2.5. Exemptions.**—The provisions of 316.2.1 through 316.2.4 above shall not apply to any story that is completely protected by an automatic sprinkler system conforming to the construction requirements of article 12.



**List of Reference Standards**

## First and Second Fire Zones

**RS 3-1 FIRST FIRE ZONE**

All that portion of the city which is included within a line beginning at the intersection of the centre lines of Dover and Albany streets, and thence running east through the centre of said Dover street to the harbor commissioners' line; thence by said harbor commissioners' line around the northerly portion of the city to a point on Charles River at the intersection of said line with the easterly line of St. Mary's street extended; thence along said easterly line of St. Mary's street and the boundary line between Brookline and Boston to the centre of Longwood avenue; thence through the centre of said avenue to the centre of St. Alphonsus street; thence through the centre of said street to the centre of Ward street; thence through the centre of said Ward street to the centre of Parker street; thence through the centre of said Parker street to the centre of Ruggles street; thence through the centre of said Ruggles street to the centre of Washington street; thence through the center of said Washington street to a point opposite the centre of Palmer street; thence through the centre of said Palmer street and through the centre of Eustis street to the centre of Hampden street; and thence through the centre of said Hampden street and the centre of Albany street to the point of beginning.

**RS 3-2 SECOND FIRE ZONE**

All that portion of the city which is included within a line beginning at the intersection of the boundary lines between the City of Boston and the cities of Somerville and Everett; thence by the boundary lines between the City of Boston and the cities of Everett and Chelsea to the intersection with the centre line

of Trumbull street extended northerly; thence by said centre line of Trumbull street extended, the centre line of Trumbull street and said centre line extended southerly to the harbor line; thence by said harbor line to its intersection with the easterly line of Pier No. 5, belonging to the Boston and Albany Railroad Company; thence by a straight line across Boston Harbor to its intersection with the harbor line at the easterly corner of Pier No. 1 in South Boston; thence by the harbor line in the northerly, easterly and southerly portions of South Boston to an angle in said harbor line nearly opposite the intersection of the centre line of Columbia road with the centre line of location of the Old Colony Railroad; thence by a straight line to the said intersection; and by the centre lines of Columbia road, Blue Hill avenue, Seaver street, Columbus avenue, Atherton and Mozart streets, Chestnut avenue, Sheridan, Centre and Perkins streets, South Huntington avenue, Castleton street and the centre line of said Castleton street extended to the boundary line between the City of Boston and the town of Brookline; thence by said boundary line to a point therein one hundred feet southwest of Washington street in the Brighton district; thence by a line parallel to and one hundred feet southwesterly from the centre line of Washington street to an angle formed by the intersection of said line with the extension of a line parallel to and one hundred feet northwesterly of the centre line of Market street; thence by said extension and said line parallel to and one hundred feet northwesterly of the centre line of Market street to a point one hundred feet south of the centre line of Western avenue; thence by a line parallel to and one hundred feet south of the centre line of Western avenue and said line extended to a point in the boundary line between the City of Boston and the town of Watertown south of Watertown Bridge, so called; thence by said boundary line and the boundary lines between the Cities of Cambridge and Somerville to the point of beginning, but not including area within the boundaries of the first fire zone.

Also those portions of Hyde Park upon or within

one hundred feet of the following named streets and squares: Everett square, so called; Fairmount avenue from River street to the Neponset river; River street from the location of the Boston and Providence Railroad to Winthrop street; Hyde Park avenue on the easterly side from the northerly side of Oak street to Everett street; Hyde Park avenue on the westerly side from the northerly side of Pine street extension, so called, to a point on said Hyde Park avenue opposite the southerly line of Everett street; Harvard avenue from River street to Winthrop street; Maple street from River street to a point one hundred and eighty feet southerly therefrom; Central avenue from River street to Winthrop street; Davison street from Fairmount avenue to a point three hundred feet northeasterly therefrom; Grove street; Pierce street from Fairmount avenue to a point three hundred feet northeasterly therefrom; Knott street from Fairmount avenue to a point three hundred feet easterly therefrom; Railroad avenue from Fairmount avenue to a point three hundred feet northeasterly therefrom; Station street from the Neponset river to a point three hundred feet northeasterly from Fairmount avenue; Walnut street from Fairmount avenue to a point three hundred feet southwesterly therefrom; Maple street from Fairmount avenue to a point one hundred and twenty-five feet westerly therefrom.





**SPECIAL USE AND OCCUPANCY REQUIREMENTS**

400.0	Scope	419.0	Public Assembly Other than Occupancy Group F-1
401.0	Definitions		
402.0	Explosion Hazards	420.0—	
403.0	Volatile Flammables	421.0	Omitted
404.0—		422.0	Drive-In Motion Picture The- atres
405.0	Omitted		
406.0	Existing Buildings	423.0	Omitted
407.0	Liquified Petroleum Gases	424.0	Parking Lots
408.0	Pyroxylin Plastics	425.0—	
409.0	Use and Storage of Motion Picture Film	428.0	Omitted
410.0	Use and Storage of Com- bustible Fibers	429.0	Swimming Pools
411.0	Combustible Dusts, Grain Processing and Storage	430.0	Open Parking Structures
412.0	Paint Spraying and Spray Booths	431.0	Deleted
413.0	Dry Cleaning Establishments	432.0	Inter-Communicating Floor Levels
414.0	Private Garages	433.0	Covered Malls, Covered Walkways and Tunnels
415.0	Public Garages	434.0	Radioactive Materials and Radiation-Producing Equipment
416.0	Motor Fuel Service Stations	RS 4	Reference Standards
417.0	Motor Vehicle Repair Shops		
418.0	Places of Public Assembly		

**TABLES**

403.2.1.1.	4-1	Capacity of Outside Underground Tanks for Volatile Flammable Liquids
408.4.2.	4-2	Exposure Distance for Pyroxylin
418.3.4.1.	4-3	Wheel Chair Viewing Positions
430.4.1.	4-4	Height and Area Limitation for Open Parking Structures

**SECTION 400.0. SCOPE**

In addition to the general requirements of this Code governing the location, construction and equipment of all buildings and structures and the fireresistive, height and area limitations of section 221.1, table 2-1 and section 221.2, table 2-2, the provisions of this article shall control all buildings and structures designed for high hazard uses and occupancies which involve extreme fire, smoke, explosion or toxic gas risks, and places of assembly in which people congregate in large numbers and which are susceptible to panic incidental to crowds. Except as herein specifically provided, reference standard RS 4 shall be deemed to comply with the requirements of this article.

Chemical plants, packing plants, grain elevators, refineries, flour mills, and other special structures may be constructed in accordance with the recognized practices and requirements of the specific industry. The building official may permit such variations from the requirements of this code which will secure reasonable and economical construction with the necessary fire, life and property safeguards. In granting such variations, due regard shall be given to the isolation of the structure and fire hazard from and to surrounding property.

**400.1. Occupancies Involving Explosion Hazards.**—The provisions of this article shall apply to all occupancies involving the storage, manufacture, handling or filling of flammable and volatile solids, liquids or gases which generate combustible and explosive air-vapor mixtures and toxic gases including nitrocellulose film; pyroxylin plastics; grain and other combustible dusts and pulverized fuels; combustible fibers; pyroxylin lacquer spraying operations; liquified petroleum gases; alcohol, ether and gasoline; flammable dusts and residues resulting from fabrication, grinding and buffing operations, and all other explosion hazard risks.

**400.2. Special High Hazards.**—When necessary to resist a higher degree of fire severity than specified herein, for high concentrations of combustible contents and for buildings of high hazard occupancies which exceed five (5) stories or sixty-five (65) feet in height, the building official may exceed the requirements of section 221.1 table 2-1 governing the fireresistance ratings of types of construction and protection of structural elements.

**400.3. Exitway Facilities.**—The exitway facilities of buildings for hazardous uses and occupancies shall conform to the requirements of article 6, except as may be modified by more restrictive provisions of this article for specific uses.

**400.4. Heating and Venting.**—The requirements herein prescribed for the installation of heating and venting appliances and equipment for high hazard uses and occupancies shall be construed as supplemental to the provisions of article 5, 10, 11 and 18.

**400.5. Light and Electric Wiring.**—Wherever flash fires and explosion hazards are involved, all artificial lighting shall be restricted to incandescent electric lights or other approved lighting with keyless sockets and dust-tight, vapor-proof gloves protected against mechanical injury. All wiring in vaults or compartments for the storage of highly flammable materials shall

be in metal or other approved conduit complying with the provisions of article 15.

**400.6. Boiler and Hazardous Equipment Room.**—Boilers and other equipment or devices, including breechings which involve flame or spark producing apparatus shall not be exposed to fire or explosive-hazard gases, vapors or volatile flammable liquids. Such rooms and equipment shall be segregated by construction of not less than two (2) hour fireresistance except as may be required for specific occupancies without openings in the enclosure walls and with means of direct entrance and egress from the exterior, or such equipment shall be located in accessory structures segregated from the main building.

**400.7. Fire-Fighting and Extinguishing Equipment.**—All buildings designed for specific hazardous occupancies shall be protected with approved automatic sprinkler systems or such other fire-extinguishing and auxiliary equipment as herein provided and in accordance with the requirements of article 12.

**400.8. Segregation of Storage Spaces.**—All rooms and spaces used for the storage of volatile and flammable materials shall be separately enclosed and segregated with fireresistive construction as herein required for specific occupancies.

**400.9. Restricted Locations.**—Except as otherwise specifically provided in section 302.3, no high hazard occupancies shall be located in the First Fire Zone, nor in a building of unprotected frame (type 4-B) construction, nor in any case within two hundred (200) feet of the nearest wall of a building classified in a public assembly, school or institutional occupancy group.

## **SECTION 401.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.0.

## **SECTION 402.0. EXPLOSION HAZARDS**

Every structure, room or space with occupancies involving explosion hazards shall be equipped and vented with explosion relief systems and devices arranged for automatic release under predetermined increase in pressure as herein provided for specific occupancies or in accordance with reference standard RS4-1.

**402.1. Venting Devices.**—Venting devices to relieve the pressure resulting from explosive air-vapor mixtures shall consist of windows, skylights, vent flues or releasing roof or wall panels

which discharge directly to the open air or to a public place or other unoccupied space not less than twenty (20) feet in width on the same lot. Such releasing devices shall be so located that the discharge end shall be not less than ten (10) feet vertically and twenty (20) feet horizontally from window openings or exterior exitway stairs or balconies in the same or adjoining buildings or structures. The exhaust shall always be in the direction of least exposure and never into the interior of the building.

**402.2. Area of Vents.**—The aggregate clear vent relief area shall be regulated by the type of construction of the building and shall be not less than herein prescribed:

Heavy reinforced concrete frame.....	1 square foot for 80 cubic feet of volume
Light structural steel frame and ordinary construction .....	1 square foot for 65 cubic feet of volume
Light wood frame construction.....	1 square foot for 50 cubic feet of volume

In no case shall the combined area of open windows, pivoted sash or wall panels arranged to open under internal pressure be less than ten (10) per cent of the area of the enclosure walls, with not less than fifty (50) per cent of the opening arranged for automatic release.

**402.3. Construction of Vents.**—All explosion relief devices shall be of an approved type constructed of light weight, noncombustible and corrosion-resistive materials, and the discharge end shall be protected with approved screens of not more than three-quarter (3/4) inch mesh, arranged to blow out under relatively low pressures.

## **SECTION 403.0. VOLATILE FLAMMABLES**

### **403.1. Process Storage.**

**403.1.1. Construction of Enclosures.**—Process rooms shall be separated from other uses and occupancies by walls, floors, and ceilings of not less than two (2) hour fireresistance with one and one-half (1-1/2) hour fire doors or the approved labeled equivalent complying with article 9. The interior door openings shall be provided with noncombustible sills not less than six (6) inches high and the room shall be vented as required in section 402.

Floors shall be liquid tight and drained to comply with section 874.

**403.1.2. Fire Protection.**—First aid fire appliances and automatic sprinklers or other extinguishing equipment shall be provided in accordance with article 12 and reference standard RS4-24. Provisions shall be made to prevent leaking flammable vapors from being exposed to open flames, fire or sparks.

**403.2. Main Storage.**—Main storage systems of volatile flammable liquids shall be constructed and installed in accordance with applicable portions of reference standards RS4-2 and RS4-3. Such storage may be either outside underground, outside aboveground, inside underground, or outside storage house. No bulk storage tank shall be located less than three hundred (300) feet from any building of assembly (occupancy group F), school (occupancy group G) or institutional (occupancy group H) occupancies.

**403.2.1. Outside Underground System.**—Outside tanks shall be buried underground below the basement level of adjacent buildings, with the top of the tanks not less than two (2) feet below grade or with a reinforced concrete or other approved structural cover not less than four (4) inches thick and a twelve (12) inch earth cover. The maximum capacity of such tanks shall be limited by their location in respect to adjacent buildings which are not an essential part of the installation and adjacent lot lines as provided in section 403.2.1.1., table 4-1.

**403.2.1.1. Table 4-1. Capacity of Outside Underground Tanks for Volatile Flammable Liquids**

Fire Separation in Feet	Quantity of Storage in Gallons
50 .....	Unlimited
40 .....	50,000
30 .....	20,000
25 .....	12,000
20 .....	6,000
10 .....	3,000

- a. When within ten (10) feet of any building not an essential part of the installation, and the top of the tank is above the lowest floor of the building, the capacity of the tank shall be not more than five hundred and fifty (550) gallons.

- b. The capacity of storage of combustible liquids other than volatile flammable as herein defined shall be restricted to five (5) times the values specified in section 403.2.1.1. table 4-1.

**403.2.2. Outside Aboveground System.**—Aboveground tanks shall be located only outside the First Fire Zone; and the capacity, location, construction and exposures shall be subject to special approvals of the building official and the fire official; but in no case shall the fire separation be less than specified in reference standard RS4-2.

**403.2.3. Inside Underground System.**—Inside underground tanks shall be located not less than two (2) feet below the level of the lowest floor of the building in which located or any other building within a radius of ten (10) feet of the tank. In no case shall such tanks be located under the sidewalk or beyond the building line. It shall be unlawful to cover any tanks from sight until after inspection and test and written approval of the building official and fire department. The maximum limit of individual tank capacity shall be not more than five hundred and fifty (550) gallons and the entire system shall be subject to special approval of the building official and fire department.

**403.2.4. Outside Storage House.**—All outside storage houses shall be constructed of noncombustible (types 1 or 2) construction. No opening shall be permitted in the enclosure walls within eleven (11) feet of adjoining property lines or with a fire exposure of less than eleven (11) feet from any building or structure not a part of the installation.

**403.2.5. Special Restrictions.**—The building official may require greater fire separations or he may limit storage capacities under severe exposure hazard conditions when necessary for public safety.

**403.3. Accessory Occupancy.**—A one-source sprinkler system shall be provided in all portions of residential (occupancy groups L-1 and L-2) institutional (occupancy groups H-1 and H-2) and assembly and school buildings (occupancy groups F and G) occupied for storage or workshop purposes which involve highly combustible and flammable materials.

**SECTION 404.0. OMITTED**

**SECTION 405.0. OMITTED**

**SECTION 406.0. EXISTING BUILDINGS**

**406.1. Special Permit for Existing Occupancies.**—Any existing hazardous occupancy which was heretofore authorized by a permit issued under the provisions of law or the regulations of the fire and building officials may be continued by special permit provided the continuance of such occupancy does not endanger the public safety.

**406.2. Existing Occupancy Prohibited.**—No existing building of frame (type 4) construction which is more than two (2) stories in height or more than five thousand (5,000) square feet in area; or of nonfireproof (type 3) construction which is more than four (4) stories in height shall be continued in use or hereafter occupied for the manufacture of pyroxylin plastics or similar materials of high fire hazard and explosive characteristics.

**406.3. Places of Assembly.**

**406.3.1. Change of Occupancy.**—No existing building or structure or part thereof shall be altered or converted into a place of assembly unless it complies with all provisions of this code applicable to places of public assembly hereafter erected.

**406.3.2. Existing Occupancy Altered.**—When an existing building or structure heretofore used as a place of public assembly is altered and the cost of such alteration is more than fifty (50) per cent of the physical value of the building as defined in article 1 Part II, all provisions of this code relating to new places of public assembly shall be complied with. When the cost of such alteration is less than fifty (50) per cent of the physical value of the building, such alterations shall comply as nearly as is practicable with the provisions of this code which govern the arrangement and construction of seats, aisles, passageways, stage and appurtenant rooms, fire-fighting and extinguishing equipment and the adequacy of exitways.

**406.3.3. Increase in Occupancy Load.**—Whenever the occupancy load of an existing place of public assembly is increased beyond the approved capacity of its exitways, the building or part thereof shall be made to comply with the requirements for a new building hereafter erected for such public assembly occupancy.

**406.4. Swimming Pools.**

**406.4.1. Change of Occupancy.**—No existing pool used for swimming or bathing or accessory equipment or part thereof shall be altered or converted for any other occupancy unless it complies with all provisions of this code applicable to the use intended.

**406.4.2. Continuation of Existing Occupancy.**—Existing swimming pools may be continued without change, provided the safety requirements of section 429.8 are observed where required by the building official.

## **SECTION 407.0. LIQUEFIED PETROLEUM GASES**

The design, construction, location, installation and operation of facilities for propane, butane and other petroleum gases, normally stored in the liquid state under pressure for use in all buildings and structures shall be in conformance with reference standard RS4-4. Refineries, tank farms and utility gas plants shall be subject to special approval in accordance with reference standard RS4-4.

## **SECTION 408.0. PYROXYLIN PLASTICS**

The provisions of this section and reference standard RS4-5 shall regulate all buildings, structures and parts thereof for the storage, handling or fabrication of pyroxylin plastics permitted by Massachusetts Law whether in raw material, process, finished product or scrap.

**408.1. Exceptions.**—The provisions of this section and of reference standard RS4-5 shall not apply to the incidental storage of articles manufactured from pyroxylin plastics offered for sale in mercantile buildings. (See section 205.)

**408.2. Restrictions.**—No permit for the storage or manufacture of pyroxylin plastics, except as specified in section 408.1, shall be issued for a building or structure hereafter erected, altered or used which is occupied or located as follows:

**408.2.1. Places of Assembly and Schools.**—Within fifty (50) feet of the nearest wall of a school, theatre or other place of public assembly;

**408.2.2. Residential Building.**—As a residential building, occupancy groups L-1, L-2 or L-3;

**408.2.3. High Hazard Occupancies.**—In quantities exceeding one thousand (1,000) pounds in buildings where paints, varnishes, or lacquers are manufactured, stored or kept for sale; or where matches, resin, oils, hemp, cotton, or any explosives are stored or kept for sale;

**408.2.4. Other Flammable Materials.**—Where drygoods, garments or other materials of a highly flammable nature are



manufactured in any portion of the building above that used for permitted nitro-cellulose products;

**408.2.5. Tenant Factory Building.**—In quantities exceeding one hundred (100) pounds in any tenant factory building (occupancy group D) in which more than five (5) people are employed or likely to congregate on one (1) floor at any one time.

**408.3. Inside Storage.**—All pyroxylin raw material and products intended for use in further manufacture shall have storage limited to one-half (1/2) day's supply but not to exceed the requirements as herein provided:

**408.3.1. Cabinets.**—Quantities of more than twenty-five (25) pounds and not more than five hundred (500) pounds shall be stored in approved cabinets constructed of noncombustible materials but in no case shall the total quantity of storage be more than one thousand (1,000) pounds in any workroom or space enclosed in floors, walls, and ceilings of not less than two (2) hour fireresistance;

**408.3.2. Vaults.**—Quantities of more than one thousand (1,000) pounds and not more than ten thousand (10,000) pounds shall be stored in vaults enclosed in floors, walls and ceilings of not less than four (4) hour fireresistance. The interior storage volume of the vault shall be not more than fifteen hundred (1,500) cubic feet and the vault shall be constructed vapor and gas-tight in accordance with the approved rules, with one and one-half (1-1/2) hour vapor-tight fire doors or the approved labeled fire door assembly equivalent on each side of the door opening. The vault shall be drained and provided with scuppers;

**408.3.3. Tote Boxes and Scrap Containers.**—During manufacture, pyroxylin materials and products not stored in finished stock rooms, cabinets or vaults shall be kept in approved covered noncombustible tote boxes. Scrap and other refuse material shall be collected in approved noncombustible containers in quantities not greater than three hundred and fifty (350) pounds and removed at frequent intervals as directed by the building and/or fire official;

**408.3.4. Ventilation.**—Each separate compartment in storage vaults shall be vented directly to the outer air through flues complying with the requirements of article 10 for low temperature chimneys, or exterior metal smokestacks, or as otherwise provided in the approved rules. The vent shall discharge not less than four (4) feet above the roof of the building or on a street, court or other open space not less than fifty (50) feet distant

from any other opening in adjoining walls which are not in the same plane, nor nearer than twenty-five (25) feet vertically or horizontally to an exterior exitway stairway or fire escape. The area of the vent shall be not less than one (1) square inch for each seven (7) pounds of pyroxylin stored;

**408.3.5. Structural Strength.**—The floors, walls, roof and doors of all vaults, structures or buildings used for the storage or manufacture of pyroxylin materials and products shall be designed to resist an inside pressure load of not less than three hundred (300) pounds per square foot;

**408.3.6. Fire Protection.**—Vaults located within buildings for the storage of raw pyroxylin shall be protected with an approved automatic sprinkler system having not less than one (1) head to each twelve (12) square feet of protected area. When vaults are subdivided into two (2) or more sections, not less than one (1) head shall be provided in each section.

**408.4. Isolated Storage Buildings.**—Pyroxylin products in quantities greater than permitted for interior storage shall be housed in isolated storage buildings. Such buildings shall be used for no purpose other than packing, receiving, shipping and storage of pyroxylin plastics unless otherwise approved by the building official.

**408.4.1. Capacity.**—The maximum storage in any fire area enclosed in construction of four (4) hour fire resistance shall be not greater than one hundred thousand (100,000) pounds. The storage capacity of the building and its separation from lot lines and other buildings on the same lot shall be limited as provided in section 408.4.2 table 4-2. When equipped with an approved automatic sprinkler system complying with the provisions of article 12 and as herein modified, the exposure distances may be decreased fifty (50) per cent. Such systems shall be provided with not less than one (1) automatic sprinkler head for each thirty-two (32) square feet of protected area.

**408.4.2. Table 4-2 Exposure Distance for Pyroxylin Storage Buildings**

<b>Maximum Quantity Stored in Pounds</b>	<b>Fire Separation from Lot Line or Other Buildings in Feet</b>
1,000.....	40
2,000.....	50
3,000.....	60
4,000.....	70

**408.4.2. Table 4-2 Continued**

5,000.....	80
10,000.....	100
20,000.....	125
30,000.....	150
40,000.....	160
50,000.....	180
75,000.....	200
100,000.....	225
150,000.....	250
300,000.....	300

**408.5. Protection.**

**408.5.1. Heating Equipment.**— All radiators, heating coils, piping and heating apparatus shall be protected with approved noncombustible mesh to maintain a clearance of six (6) inches of all pyroxylin products from such equipment. All piping and risers within six (6) feet of the floor shall be insulated with approved noncombustible covering unless protected with wire guards.

**408.5.2. Lighting Control.**— All lighting shall comply with the provisions of section 400.5 and shall be controlled from panel boards located outside of storage compartments and vaults.

**408.5.3. Standpipes.**— First-aid standpipes shall be provided for each five thousand (5,000) square feet of floor area equipped with one and one-half (1-1/2) inch hose, complying with article 12.

**408.5.4. Automatic Sprinklers.**— All manufacturing and storage spaces and vaults shall be protected with an approved automatic sprinkler system as herein specified and with fire pails and portable fire extinguishers complying with article 12 and as approved by the fire department.

**408.5.5. Special Protection.**— Special chemical extinguishers and other first-aid fire appliances shall be provided around motors and other electrical equipment in accordance with articles 12 and 15 and approved rules.

## **SECTION 409.0. USE AND STORAGE OF MOTION PICTURE FILM**

The use and storage of motion picture film and related operations shall comply with reference standard RS4-12 and the provisions of this section.

**409.1. Film.**—The projection, use or storage of film having a nitrocellulose base or an other flammable type base shall not be permitted except under conditions specified in special permits when issued by the fire department and when permitted by law. Safety film meeting the specifications and test standards of reference standard RS4-13 may be projected, used and stored.

**409.2. Projection Machines.**—Projection machines shall meet the electrical requirements of article 15. The lamp housing of projection machines using carbon-arc or other light sources that emit gaseous discharge shall be equipped with, or connected to a mechanical ventilation system of adequate capacity to exhaust the products of combustion through ducts directly to the outdoors. Such duct systems shall comply with the requirements of article 18. When more than one projection machine or other facility employing a carbon-arc or similar light source is used, all may be vented by the same duct system if the capacity is adequate for all facilities so connected.

**409.3. Projection Rooms or Booths.**—When enclosed, rooms or booths, for the use and operation of motion picture projectors hereafter installed as an integral part of a building, shall be enclosed in walls, floor and ceiling of approved noncombustible materials and construction, as herein provided.

**409.3.1. Construction of Projection Rooms.**—The size of the room shall be adequate to accommodate the apparatus and equipment, permit manual operation, and provide a clear working space of at least two (2) feet around the projection apparatus, but in no case less than forty-eight (48) square feet in area and seven (7) feet in height for one projector and twenty-four (24) square feet for each additional machine. Observation and projector openings shall in no case exceed a maximum of seven hundred twenty (720) square inches in area and port shutters may be omitted.

**409.3.2. Exitways from Projection Rooms.**—At least two (2) exitways shall be provided, equipped with incombustible or metal clad self-closing doors, opening outwardly, not less than two (2) feet by six (6) feet in size, unless otherwise approved by the building official. No point within the room, booth, or gallery shall be more than fifty (50) feet from an opening into a corridor or space that provides access to an exitway at a distance not greater than seventy-five (75) feet.

**409.3.3. Ventilation of Projection Rooms or Booths.**—Ventilation shall be provided by an approved mechanical system of

ventilation, exhausting either directly to the outdoors or through a noncombustible flue, which shall be used for no other purpose. The exhaust capacity shall be not less than fifteen (15) cubic feet nor more than fifty (50) cubic feet per minute for each arc amp, plus two hundred (200) cubic feet per minute for the volume of the room. All ventilating flues shall be constructed and installed to comply with article 18. All fresh air intakes other than direct open air supply shall be protected with fire shutters arranged to operate automatically.

**409.3.4. Lighting Control.**—Provisions shall be made for control of the auditorium lighting and the emergency lighting systems of theatres from inside of the booth and from at least one other convenient point in the building as required in section 418.8.

**409.3.5. Electrical Equipment.**—Separate compartments of similar construction to the projection booth shall be provided for storage batteries and motor generators, respectively. Ventilation shall be provided for such compartments; ventilation for motor compartment being independent of any other system. The duct from such compartments leading to outdoors shall be constructed of approved acid-resisting noncombustible material.

#### **409.4. Motion Picture Studios.**

**409.4.1. Construction.**—All buildings designed or used as motion picture studios shall be protected with an approved two-source automatic sprinkler system complying with the provisions of article 12; except that the building official may exempt rooms designed for housing electrical equipment from this requirement when constructed of fireproof (type 1) construction.

**409.4.2. Special Rooms.**—Rooms and spaces used as carpenter and repair shops, dressing rooms, costume and property stage rooms shall be enclosed in floors, walls and ceilings of not less than two (2) hour fireresistive construction.

**409.4.3. Trim, Finish and Decorative Hangings.**—All permanently attached acoustic, insulating and light reflecting materials and temporary hangings on walls and ceilings shall comply with the requirements of article 9.

**409.5. Film Laboratories.**—No film laboratories shall be conducted in other than buildings or structures built of noncombustible materials equipped throughout with an approved automatic sprinkler system.

**409.6. Film Exchange.**— All film exchanges and depots shall be housed in buildings and structures of noncombustible construction equipped throughout with an approved automatic sprinkler system.

## **SECTION 410.0. USE AND STORAGE OF COMBUSTIBLE FIBERS**

The provisions of this section shall apply to all buildings and structures involving the storage or use of finely divided combustible vegetable or animal fibers and thin sheets or flakes of such materials, involving a flash fire hazard, including among others, cotton, excelsior, hemp, sisal, jute, kapok, and paper and cloth in the form of scraps and clippings in excess of one thousand (1,000) pounds. The provisions of reference standard RS4-6 except as herein specifically provided shall be deemed to conform to the provisions of this Code.

**410.1. Construction Requirements.**— All buildings designed for the storage of combustible fibers as herein described shall be constructed within the limits of height and area specified in section 221.2 table 2-2 for high hazard occupancy (occupancy group A) except as follows:

**410.1.1. Special Limits.**— No single storage room or space shall be more than twelve hundred fifty (1,250) square feet in area or more than twelve thousand five hundred (12,500) cubic feet in volume unless of protected noncombustible (type 2-B) or better construction;

**410.1.2. Floor Loads.**— The floors of all buildings designed for the storage of combustible fibers shall not be loaded in excess of one-half (1/2) the safe load capacity of the floor, nor shall such materials be piled to more than two-thirds (2/3) of the clear story height;

**410.1.3. Salvage Doors.**— Every exterior wall shall be provided with a door to each storage compartment arranged for quick removal of the contents;

**410.1.4. Wall Openings.**— All openings in outside walls shall be equipped with approved fire doors and fire windows complying with article 9;

**410.1.5. Roof Openings.**— All skylights, monitors and other roof openings shall be protected with galvanized wire or other ap-

proved corrosion-resistive screens with not less than thirty-six (36) meshes to the square inch or with wired glass in stationary frames;

**410.1.6. Boiler Rooms.**—All power and heating boilers and furnaces shall be located in detached boiler houses or in a segregated boiler room enclosed in three (3) hour fireresistive construction with direct entrance from the outside, except that rooms containing gas-fired heating equipment may have openings into the warehouse protected with one and one-half (1-1/2) hour fire doors or their approved equivalent;

**410.1.7. Deleted.**

**410.2. Fire Protection.**—Fire-extinguishing equipment shall be provided complying with article 12 consisting of casks, pails and portable chemical extinguishers and standpipes. Where deemed necessary by the building official, a system of outside hydrants and hose shall be provided. An approved automatic sprinkler system complying with article 12 shall be required when the area within type A fire divisions exceeds one thousand (1,000) square feet.

**410.3. Housekeeping.**—No ashes, waste, rubbish or sweepings shall be kept in wood or other combustible receptacles and shall be removed from the premises daily. No grass or weed shall be allowed to accumulate at any point on the premises.

**410.4. Open Storage.**—Only temporary open storage of combustible fibers shall be permitted on the same premises with a fiber warehouse and shall be kept covered on top and sides with tarpaulins secured in place. Not more than seven thousand two hundred (7,200) cubic feet of fiber shall be stored in the open; and fire-extinguishing equipment shall be provided as directed by the building official.

**410.5. Special Treatments.**—When combustible fibers are packed in approved special noncombustible containers or when packed in bales covered with approved wrappings to prevent ready ignition, or when treated by approved chemical dipping or spraying processes to eliminate the flash fire hazard, the restrictions governing combustible fibers shall not apply.

## **SECTION 411.0. COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE**

The provisions of this section and of reference standard RS4-7 except as herein specifically modified shall apply to all buildings

in which materials producing flammable dusts and particles which are readily ignitable and subject to explosion hazards are stored or handled, including among others, grain bleachers and elevators, malt houses, flour, feed or starch mills, wood flour manufacturing and manufacture and storage of pulverized fuel and similar uses.

#### **411.1. Construction Requirements.**

**411.1.1. Buildings.**—All such buildings and structures, unless herein otherwise specifically provided, shall be of fireproof (type 1), noncombustible (type 2), or of laminated planks or lumber sizes qualified for heavy timber mill (type 3A) construction, within the height and area limits of high hazard occupancy (occupancy group A) of section 221.2 table 2-2; except that when erected of fireproof (type 1A or 1B) construction and the height and area may be unlimited.

**411.1.2. Grinding Rooms.**—Every room or space for grinding or other operations producing flammable dust shall be enclosed with floors and walls of not less than two (2) hour fire-resistance when the area is not more than three thousand (3,000) square feet and of not less than four (4) hour fire-resistance when the area is greater than three thousand (3,000) square feet.

**411.1.3. Conveyors.**—All conveyors, chutes, piping and similar equipment passing through the enclosures of such rooms or spaces shall be constructed dirt and vapor-tight, of approved noncombustible materials complying with the applicable requirements of article 16.

**411.2. Explosion Relief.**—Means for explosion relief shall be provided as specified in section 402, or such spaces shall be equipped with the equivalent mechanical ventilation complying with article 18.

**411.3. Grain Elevators.**—Grain elevators, malt houses and buildings for similar uses shall be located within thirty (30) feet of interior lot lines or structures on the same lot, except when erected along a railroad right of way.

**411.4.** Deleted.

### **SECTION 412.0. PAINT SPRAYING AND SPRAY BOOTHS**

The provisions of this section shall apply to the construction, installation and use of buildings and structures or parts thereof for the spraying of flammable paints, varnishes, and lacquers or other flammable materials, mixtures, or compounds used for



painting, varnishing, staining or similar purposes. All such construction and equipment shall comply with reference standard RS4-8.

**412.1. Location of Spraying Processes.**—Such processes shall be conducted in a spraying space, spray booth, spray room or shall be isolated in a detached building or as otherwise approved by the building official.

**412.2. Construction.**

**412.2.1. Spray Spaces.**—All spray spaces shall be ventilated with an approved exhaust system to prevent the accumulation of flammable mist or vapors. When such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of fire.

**412.2.2. Spray Booths.**—All spray booths shall be constructed of approved noncombustible materials equipped with mechanical ventilating systems.

**412.2.3. Spray Rooms.**—All spray rooms shall be enclosed in partitions of substantial construction of approved noncombustible materials consistent with the requirements of reference standard RS4-8. Floors shall be waterproofed and drained in an approved manner. Floor drains to the building drainage system and the public services shall be prohibited.

**412.2.4. Storage Rooms.**—Spraying materials in quantities of not more than twenty (20) gallons may be stored in approved cabinets ventilated at top and bottom; when in quantities of more than twenty (20) gallons and not more than one hundred (100) gallons, they may be stored in approved double-walled noncombustible cabinets vented directly to the outer air; and all spraying materials in quantities of more than one hundred (100) gallons shall be stored in an enclosure of not less than two (2) hour fire resistance or in a separate exterior storage building. In no case shall such storage be in quantities of more than two hundred and fifty (250) gallons, except when stored in isolated storage buildings; and except further that not more than twenty-five (25) gallons of spraying materials shall be stored in buildings in which pyroxylin products are manufactured or stored.

**412.3. Ventilation of Spraying Processes.**—Spraying or dipping spaces shall be mechanically ventilated during spraying or dipping operations so that the velocity of air is at least one hundred (100) linear feet per minute in the breathing zone of the operator, conveying air toward the exhaust hood. The ventilat-

ing system shall be of sufficient capacity to prevent the accumulation of mist or vapors. Air shall be admitted to the spraying or dipping spaces in an amount equal to the capacity of the fan or fans and in a manner that prevents short-circuiting the path of air in the working zone of such spaces. The exhaust fan control shall be interconnected with spray guns so that they cannot be operated without the ventilation system being in operation. Exhaust fans shall in addition, be arranged to operate independently of spray guns. Ventilation equipment shall be kept in operation for a sufficient length of time after spraying or dipping operations to exhaust all vapors, fumes, or residues of spraying materials from the spray space, dip space, or drying room.

**412.3.1. Ventilating Ducts.**—Ventilating ducts shall run directly to the outer air and be protected with a hood against the weather. Ventilating ducts shall be constructed and installed to comply with section 1019 and 1119 and article 18, but shall not terminate within ten (10) feet horizontally of any chimney outlet, or within twenty (20) feet of any exitway or any opening in an adjoining wall.

**412.3.2. Make-up Air.**—Make-up air shall be supplied from a point outside the spraying or dipping space.

**412.3.3. Exhaust System.**—The exhaust system from any spraying, dipping, or drying space shall not be connected to any other ventilating system or be discharged into a chimney or flue used for the purpose of conveying gases of combustion.

**412.3.4. Equipment Location.**—Unless equipped with approved explosion-proof motors with nonferrous blade fans, the mechanical exhaust equipment shall be located outside the spray spaces.

**412.3.5. Access Doors.**—Adequate access doors or panels, tightly fitted, shall be provided to permit inspection and cleaning of ducts.

**412.4. Electrical Equipment.**—Artificial lighting and electric equipment shall comply with section 400.5.

**412.5. Fire Protection.**—Sprinkler heads shall be provided in all spray, dip and immersing spaces and storage rooms and shall be installed in accordance with the requirements of article 12. When buildings containing spray areas are not equipped with an approved automatic sprinkler system, the sprinkler heads in booths and other spray areas and storage rooms may be supplied from the building water supply when approved by the

building official, to comply with the provisions of section 1213 for partial sprinkler systems.

## SECTION 413.0. DRY CLEANING ESTABLISHMENTS

Before any dry cleaning plant is constructed or an existing plant is remodeled or altered, complete drawings shall be filed showing to scale the relative location of the dry cleaning area, the boiler room, finishing department, solvent storage tanks, pumps, washers, drying tumblers, extractors, filter traps, stills, piping and all other equipment involving the use of flammable liquid solvents. All dry cleaning by immersion and agitation shall be carried on in closed machines, installed and operated in accordance with reference standard RS4-9.

**413.1. Classification.**—For the purpose of this code, all dry cleaning and dry dyeing establishments shall be classified as follows:

**413.1.1. High Hazard.**—All establishments employing gasoline or other solvents having a flash point below one hundred (100) degrees F. (Tag. closed-cup).

**413.1.2. Moderate Hazard.**—All establishments employing solvents having a flash point between one hundred (100) degrees F. and one hundred thirty-eight and two-tenths (138.2) degrees F. (Tag. closed-cup).

**413.1.3. Low Hazard.**—All establishments employing solvents with a flash point higher than one hundred thirty-eight and two-tenths (138.2) degrees F. (Tag. closed-cup).

**413.2. Construction of Dry Cleaning Plants.**

**413.2.1. High Hazard.**—The construction or installation of high hazard dry cleaning establishments shall be prohibited.

**413.2.2. Moderate Hazard.**—Moderate hazard dry cleaning establishments shall meet all of the requirements of this code applicable to industrial occupancy group D-1 buildings. The room or space in which such operations are conducted shall be enclosed in not less than two (2) hour fireresistive construction with not less than two (2) exitways from each dry cleaning or dry dyeing room or space.

**413.2.3. Low Hazard.**—Low hazard dry cleaning establishments shall meet all of the requirements of this code applicable to industrial occupancy group D-2 buildings; except that such occupancies shall not be located in basements nor in a building used for public assembly (occupancy group F) or for institutional (occupancy group H) purposes.

**413.2.4. Floor Construction of Dry Cleaning Plants.**—The floor finish in moderate hazard dry cleaning establishments shall be noncombustible and impervious.

**413.2.5. Basements of Dry Cleaning Plants.**—The basements of all buildings in which moderate hazard dry cleaning establishments are conducted shall be completely separated from the superstructure with unpierced floor construction of not less than two (2) hour fire-resistance. The access to such basements shall be from the exterior only.

**413.3. Boiler Room Separation.**—Boiler rooms and heating equipment for moderate hazard dry cleaning plants shall be separated from drying rooms, dry cleaning and dry dyeing rooms with solid walls of not less than two (2) hour fire-resistance; or such boiler rooms shall be located in a separate building.

**413.4. Ventilation.**—Mechanical ventilation systems in moderate hazard plants shall be adequate to effect ten (10) complete air changes per hour. Low hazard dry cleaning establishments shall be provided with mechanical ventilation adequate to effect four (4) complete air changes per hour. Ventilating systems shall be arranged in such manner as to prevent solvent vapors from being admitted to the combustion area of any device requiring an open flame. Sufficient make-up air shall be introduced into all parts of the establishment to equal the air exhausted by the dry cleaning units, dryers, and exhaust ventilating system. Such air shall not contain any flammable vapors. Openings or stacks discharging solvent vapor-air mixtures to the outdoors shall be located in accordance with the provisions of article 18.

**413.5. Solvent Storage.**—Interior above ground storage shall be permitted for solvents with a flash point above one hundred (100) degrees F. (tag. closed-cup) provided the aggregate quantity of such solvent in use in the system and in storage is not more than five hundred and fifty (550) gallons and the capacity of any individual tank is not more than two hundred and seventy-five (275) gallons.

**413.6. Electric Wiring and Equipment.**—All electrical equipment and wiring shall conform to the requirements of article 15 for hazardous locations; and the cylinders and shells of all washing machines, drying tumblers, drying cabinets, extractors, and all above ground storage containers shall be grounded as therein required.

**413.7. Fire Protection.**—Every dry cleaning room, and dry dyeing room employing moderate hazard solvents shall be protected with a fire-extinguishing system consisting of approved automatic sprinklers, manually controlled steam blankets, carbon dioxide flooding systems or other approved fire-extinguishing equipment.

**413.8. Coin-Operated Units.**—In coin-operated establishments all dry cleaning units shall be installed in such a manner that the working or maintenance portion of the equipment shall be separated from the front of the units by solid noncombustible partitions. Coin-operated units shall be located within a diked area, all parts of which are impervious to the solvent used in such units. The diked section shall be a four (4) inch curb above above the floor. Provisions shall be made for the collection of solvent spillage into tanks of capacity sufficient to contain all of the solvent in the dry cleaning units served, and for return of the solvent to the cleaning units through a closed pipe system. Access doors to the space in back of the units shall be kept closed and locked. Solvent storage tanks and other sources of danger shall be so situated as to be inaccessible to the general public. In addition to the mechanical ventilation required for low hazard dry cleaning establishments, the following mechanical ventilation shall be provided:

**413.8.1. Inward Flow.**—All dry cleaning units shall have facilities that create an inward flow of one hundred (100) cubic feet of air per minute into the unit when the loading door is opened.

**413.8.2. Emergency Ventilation.**—Emergency ventilation of the space in back of the dry cleaning units shall be provided so that in emergencies a minimum of one (1) air change per minute in the enclosed space will be provided. Emergency ventilation equipment shall be on a circuit that is separate from the general lighting and power circuits, and shall be taken off ahead of the main switchboard, or shall be connected to the emergency lighting power source when such source is provided.

**413.8.3. Scavenger Duct.**—A scavenger duct system shall be provided in the space in back of the units at each unit, and shall be designed to pick up vapor surrounding the equipment near the floor and exhaust it at the rate of one hundred (100) cubic feet per minute. Scavenger ducts shall not be less than five (5) square inches in area.

**413.9. Separation of Direct-Fired Dryers.**—In moderate hazard dry cleaning establishments, direct-fired dryers shall not be used. In low hazard dry cleaning establishments using nonflammable solvents only, direct-fired dryers may be used, but such dryers shall not be located within twenty-five (25) feet of a dry cleaning unit unless a noncombustible partition (which may be glazed), equipped with self-closing doors, is provided between the dry cleaning unit and the flame producing device. This partition may provide either complete or partial separation, provided that any partial separation shall be so arranged that the line of air travel around the partition from the cleaning units to the dryer is a minimum of twenty-five (25) feet. Where a solid noncombustible partition is constructed extending to the ceiling and all portions of the enclosure are solid, except for self-closing access doors, and outdoor air for combustion and drying is supplied, the separation may be reduced to fifteen (15) feet.

## **SECTION 414.0. PRIVATE GARAGES**

Private garages shall comply with the requirements of reference standard RS4-21 and the provisions of this section.

### **414.1. Attached Garages.**

**414.1.1. One- and Two-Family Dwellings.**—Private garages, attached to, or located above or below, a one- or two-family dwelling shall have walls, partitions, floors and ceilings separating the garage space from the dwelling constructed of not less than one (1) hour fire-resistance, with the sills of all door openings between them raised not less than four (4) inches above the garage floor. There shall be only one (1) opening between the garage and each dwelling unit and there shall be no opening from a garage directly into a living room, sleeping room or kitchen. The door opening protectives shall be three-quarter (3/4) hour fire doors complying with article 9 or one and three-quarter (1-3/4) inch bonded solid core wood doors.

**414.1.2. Multi-Family Dwellings.**—Private garages located above or below multi-family dwellings and in which no gasoline or oil is stored or handled shall be of protected construction of not less than two (2) hour fire-resistance.

**414.1.3.** Deleted.

**414.1.4. Other Conditions.**—All private garages not falling within the purview of sections 414.1.1 or 414.1.2, attached to or located beneath a building shall comply with the requirements of section 415.1.3 for public garages.

**414.2. Means of Egress.**—Where living quarters are attached to, or located above or below a private garage, required means of egress facilities shall be protected from the garage area with one (1) hour fireresistive construction.

**414.3. Floors.**—Garage floors shall be of concrete. The sills of all door openings connecting a garage with a dwelling shall be raised at least four (4) inches above the garage floor.

## **SECTION 415.0. PUBLIC GARAGES**

Public garages shall comply with the applicable requirements of the following sections and the requirements of reference standard RS4-21. The portions of such buildings and structures in which gasoline, oil and similar products are dispensed shall comply with the requirements of section 416; the portions in which motor vehicles are repaired shall comply with section 417; and the portions in which paint spraying is done shall comply with the requirements of section 412.

**415.1. Construction.**—All group 1 public garages hereafter erected shall be classified as storage buildings, moderate hazard (occupancy group B-1) and all group 2 public garages shall be classified as storage buildings, low hazard (occupancy group B-2) and shall conform to the height and area limitations of section 221.2 table 2-2 except as herein specifically provided. The areas used for dispensing gasoline in such buildings shall be located on the grade floor and shall comply with the requirements of section 416.

**415.1.1. Basements.**—The first floor construction of public garages of all classifications with basements shall be constructed of not less than two (2) hour fireresistance and shall be water and vapor proof. Where openings are provided in the floor they shall be protected by a curb or ramp not less than six (6) inches high above the floor to avoid the accumulation of explosive liquids or vapors and prevent them from spilling to the lower floor. There shall be not less than two (2) means of egress from such areas, one (1) of which shall be directly to the outside independent of the exitways serving other areas of the building. A one-source sprinkler system shall be provided in basement and sub-basement public garages.

**415.1.2. Mixed Occupancy.**—No group 1 public garage shall be located within, or attached to, a building occupied for any other use, unless separated from such other use by construction meet-

ing the requirements of section 902.4 table 9-2 for type A fire divisions. Elevators, stairways, and exitway passageways connecting group 1 garages to other occupancies shall be accessible only through vestibules constructed of materials having a two (2) hour fireresistance rating. The floor area of such vestibules shall be at least fifty (50) square feet but not more than seventy-five (75) square feet. Ventilation shall be provided by a louver permanently open to the outdoor air having a net free area of one hundred forty-four (144) square inches, located near the floor. Vestibule doors shall be one and one-half (1-1/2) hour self-closing fire doors, with a six (6) inch high sill provided at the door between the vestibule and the garage. Both doors shall swing in the direction of the elevators, stairways or exitway passageways.

**415.1.3. Roof Storage of Motor Vehicles.**—The roof of a public garage shall not be used for the parking or storage of motor vehicles unless the building is of construction type 1A, 1B or 2A, except as otherwise provided for on open parking structures. When the roof of a building is used for parking or storage of motor vehicles it shall be provided with a parapet wall or guard rail not less than three (3) feet six (6) inches in height and a wheel guard not less than eight (8) inches in height located and sufficiently anchored so as to prevent any vehicle from striking the parapet wall or guard rail. Guard rails shall comply with the requirements for railings in article 7.

**415.1.4. Floor Construction and Drainage.**—Floors of public garages shall be graded to drain through oil separators or traps to avoid accumulation of explosive vapors in building drains or sewers as provided in article 15. The floor finish shall be of concrete or other approved non-absorbent, noncombustible material.

**415.2. Ventilation.**—Public garages shall be ventilated in accordance with the following provisions:

**415.2.1. Mechanical Ventilation.**—Garage spaces above or below grade except as provided in section 415.2.3 below shall be provided with mechanical ventilation according to one (1) of or a combination of the following methods:

- a. Air exhaust at the rate of not less than one (1) cfm per square foot of total floor area with properly designed means for air inflow.
- b. Air supply at the rate of not less than one (1) cfm per square foot of total floor area with properly designed means for air outflow.



- c. Air exhaust or air supply at a rate sufficient to maintain an average concentration of carbon monoxide not to exceed one hundred (100) parts per one million (1,000,000) parts of air for periods longer than one (1) hour and with a maximum concentration at any time not to exceed four hundred (400) parts of carbon monoxide per one million (1,000,000) parts of air. The concentration of carbon monoxide shall be determined by periodic tests taken between three (3) and four (4) feet from the floor by means of approved carbon monoxide detector tubes or other equivalent means. This method of mechanical ventilation may be used only if the overall design includes automatic ventilating fan control by means of approved carbon monoxide monitoring devices or by other approved means located so as to provide full protection for the occupancy.

**415.2.2. Air Supply and Exhaust.**—Air supply shall be taken from an uncontaminated source. Exhaust outlets shall be located in accordance with the requirements of article 18 with one-half (1/2) of them located six (6) inches above floor level. In public garages where motor vehicles are parked by mechanical means, the ventilation requirements shall be one-half (1/2) of those required above.

**415.2.3. Natural Ventilation.**—Garage spaces above grade provided with natural ventilation having a free openable area of at least five (5) per cent of the total floor area of the space and having adjustable openings measuring at least six (6) inches by four (4) inches located within six (6) inches of the floor and at most sixteen (16) feet apart on all outside and court walls need not be provided with mechanical ventilation.

**415.2.4. Repair Shops or Rooms.**—When motor vehicles are to be operated or engines are run for test purposes or minor adjustments, provisions shall be made to collect the exhaust fumes from each vehicle individually and to discharge such fumes to the outer air by means of a positive induced draft. The discharge from such systems shall be located so as not to create a hazard to adjoining properties, but not less than eight (8) feet above the adjacent ground level on the exterior of the building and shall discharge into a yard or court. When necessary to discharge across a walkway or private thoroughfare the discharge opening shall be carried to a height of not less than twenty-five (25) feet above the ground level or to a distance

four (4) inches above the highest point of the wall of the building or structure on which it is located.

**415.2.5. Pits.**—No pits shall be installed in floors below the first; and pits in first and upper stories shall be provided with mechanical ventilation adequate to provide the ventilation required under section 415.2. The ventilation system shall be operated at all times the pits are occupied by human beings.

**415.3. Special Hazards.**—No process shall be conducted in conjunction with public garages involving volatile flammable solvents, except as provided in section 403 for the storage and handling of gasoline and other volatile flammables.

**415.4. Heating and Protection of Equipment.**—Radiation and heating coils and pipes located within six (6) inches of the floor shall be protected with wire mesh or other approved noncombustible shields of adequate strength; and with asbestos or other insulation on top of the equipment when located in partitions or near combustible racks or woodwork.

**415.5. Boiler Rooms of Public Garages.**—All heat generating plants other than approved direct fired heaters shall be located in separate buildings or shall be separately enclosed within the structure with solid, water and vapor tight masonry. All rooms housing boilers, stoves or other heating apparatus shall be cut off from all other parts of the building with four (4) hour fireresistive construction with entrance from outside only, and no openings through the fire division other than those necessary for heating pipes or ducts.

**415.6. Sprinkler and Standpipe Requirements.**—A one-source sprinkler system shall be provided in garages more than ten thousand (10,000) square feet in area or more than four (4) stories high used for the storage of trucks loaded with combustible materials, when of other than fireproof or protected noncombustible construction (types 1A or 1B) and (2A or 2B); and in all group 1 public garages, as defined in article 2, located in buildings of which the upper stories are designed for other uses, when such garages have a storage capacity of twenty (20) or more automobiles; except that when such buildings are more than seventy (70) feet in height, a two-source sprinkler system shall be provided. In group 2 public garages, as defined in article 2, located in buildings of which their upper stories are designed for other uses, standpipe systems complying with sections 1207 and 1208 or section 1209 shall be provided.

**415.6.1. Bus Garages.**—A one-source sprinkler system shall be provided in all bus garages which are more than thirty (30) feet or two (2) stories in height, or which are designed as passenger terminals for four (4) or more buses, or for the storage or loading of four (4) or more buses.

**415.7. Vehicle Exitways.**—Vehicle exitways from garages shall have a clear and unobstructed view, as they approach pedestrian sidewalks, of at least a ten (10) foot width from the center line of the lane to the corner of the building at the sidewalk. At a distance back five (5) feet from the sidewalk line this width may be reduced to five (5) feet.

## **SECTION 416.0. MOTOR FUEL SERVICE STATIONS**

**416.1. Construction.**—Buildings and structures used for the storage and sale of motor fuel oils may be of all types of construction within the height and area limitations of section 221.2 table 2-2 for business (occupancy group E) buildings and as modified by sections 303 and 304.

**416.1.1. Opening Protectives.**—All permissible openings in walls with a fire separation distance of less than twenty (20) feet shall be protected with approved fire windows or fire doors complying with article 9, except doors in such walls to rest rooms.

**416.1.2. Basements.**—Motor fuel service stations shall have no cellars or basements; and when pits are provided they shall be vented as required in section 415.2.

**416.2. Gasoline Storage.**—All volatile flammable liquid storage tanks shall be installed below ground and vented as specified in section 403.

**416.3. Location of Pumps.**—No gasoline pumps or other mechanical equipment shall be installed so as to permit servicing of motor vehicles standing on a public street or highway; except when necessitated by the widening of streets or highways, the use of the outer driveway of existing service stations may be continued for servicing of vehicles when approved by the authority having jurisdiction. The canopies and supports over pumps and service equipment when located less than twenty (20) feet from interior lot lines or from any building or structure shall be constructed of approved noncombustible materials.

## **SECTION 417.0. MOTOR VEHICLE REPAIR SHOPS**

All buildings and structures designed and used for repair and servicing motor vehicles, motor boats, aircraft, or other motor driven means of transportation shall be subject to the limitations of section 221.1 table 2-1 and section 221.2 table 2-2 for moderate hazard industrial buildings (occupancy group D-1). Such buildings shall be used solely for that purpose.

**417.1. Enclosure Walls.**—Exterior walls, when located within six (6) feet of interior lot lines or other buildings shall have no openings therein.

**417.2. Handling of Volatile Flammables.**—All volatile flammables shall be stored and handled as provided in section 416.2.

**417.3. Ventilation.**—All rooms and spaces used for motor vehicle repair shop purposes shall be provided with an approved system of mechanical ventilation providing at least four (4) air changes per hour and meeting the requirements of section 415.2 and article 18.

**417.4. Fire Prevention.**—No open gas flames except heating devices complying with section 415.5, torches, welding apparatus, or other equipment likely to create an open flame or spark shall be located in a room or space in which flammable liquids or highly combustible materials are used or stored.

## **SECTION 418.0. PLACES OF PUBLIC ASSEMBLY**

The provisions of this section shall apply to all buildings and structures, or parts thereof, which are classified in the occupancy group F-1, and in all other places of public assembly, (occupancy groups F-2, F-3 and F-4), except as specifically exempted in section 419.

**418.1. Restrictions.**

**418.1.1. High Hazard Occupancies.**—No place of public assembly shall be permitted in a building classified in the high hazard group (occupancy group A).

**418.1.2. Deleted.**

**418.1.3. Frame Construction.**—No theatre with stage, fly gallery and rigging loft shall be permitted in a building of frame type 4-B construction.

**418.1.4. Location.**—All buildings used for assembly purpose shall front on at least one (1) street in which the main entrance

and exitway discharge shall be located. The main exitway discharge shall be of sufficient width to accommodate one-half ( $\frac{1}{2}$ ) of the total occupant load, but shall be not less than the total required width of all aisles, exitway passageways and stairways leading thereto, and shall connect to a stairway or ramp leading to a street. A bowling alley shall have a main exitway of sufficient capacity to accommodate fifty (50) per cent of the total occupant load, without regard to the number of aisles which it serves.

**418.1.5. Trim, Finish and Decorative Hangings.**—All permanent acoustic, insulating and similar materials and accessories shall comply with the flame resistance requirements of article 9. Moldings and decorations around the proscenium openings shall be constructed entirely of noncombustible material.

**418.1.6. Existing Buildings.**—Nothing herein contained shall prohibit the alteration of a building heretofore occupied as a place of public assembly for such continued use provided the occupancy load is not increased and seats, aisles, passageways, balconies, stages, appurtenant rooms and all special permanent equipment comply with the requirements of this article.

**418.1.7. New Buildings.**—No building not heretofore occupied as a place of public assembly shall hereafter be altered to be so occupied unless it is made to comply with all the provisions of this article.

**418.2. Means of Egress Requirements.**—Every place of assembly and parts thereof including tiers, balconies and individual rooms so used shall have means of egress sufficient to provide for the total capacity thereof as determined in accordance with article 6, except as herein provided for or as specifically exempted in section 419.

**418.2.1. Types of Exitways.**—Each level of an assembly occupancy shall have access to the main exitway and in addition shall be provided with exitways of sufficient width to accommodate two-thirds ( $\frac{2}{3}$ ) of the total occupant load served by that level. Such exitways shall open directly to a street or into an exitway court, enclosed stairway, outside stairway, or exitway passageway leading to a street. Such exitways shall be located as far apart as practicable and as far from the main exitway as practicable. Such exitways shall be accessible from a cross aisle or a side aisle. The number, location and construction of all exitways shall comply with all the provisions of section 418.2.

**418.2.2. Minimum Number of Exitways.**—Every place of public assembly with an occupant load of one thousand (1000) persons shall have at least four (4) separate exitways as remote from each other as practicable. Every place of public assembly with an occupant load of six hundred (600) to one thousand (1000) persons shall have at least three (3) separate exitways as remote from each other as practicable. Every place of public assembly with an occupant load of three hundred (300) to six hundred (600) shall have at least two (2) separate exitways as remote from each other as practicable. Every place of public assembly with an occupant load of less than three hundred (300) shall have at least two (2) means of egress as remote from each other as practicable; consisting of separate exitway discharges or doors leading to a corridor or other spaces giving access to two (2) separate and independent exitways in different directions.

**418.2.3. Number of Stairways in Auditorium.**—Each tier above the main floor of a theatre or other auditorium shall be provided with at least two (2) interior enclosed or protected stairways which shall be located on opposite sides of the structure; except that enclosures shall not be required for stairs serving the first balcony only, or mezzanine thereunder. Such stairways shall discharge to a lobby on the main floor. Exitway stairways serving galleries above the balcony shall lead directly to the street or open public space as provided in section 418.2.1.

**418.2.4. Emergency Means of Egress from Main Floor of Auditorium.**—In addition to the main floor entrance and exitway, emergency means of egress shall be provided in conformance with section 418.2.1. on both sides of the auditorium which lead directly to an exitway and/or exitway discharge to the street independent of other exitways, or to an exitway court as defined in this code.

**418.2.5. Emergency Egress from Balconies and Galleries.**—Emergency means of egress shall be provided in conformance with section 418.2.1. from both sides of each balcony and gallery with direct exitways and/or exitway discharges to the street or to an exitway court. There shall be no communication from any portion of the building to the emergency exitway stairways except from the tier for which such exitway is exclusively intended.

**18.2.6. Exitway Courts.**—All exitway courts shall be not less than six (6) feet wide for the first six hundred (600) persons to be accommodated or fraction thereof, and shall be increased one (1) foot in width for each additional two hundred fifty (250) persons. Such courts shall extend sufficiently in length to indicate the side and rear emergency exitways from the auditorium.

**18.2.7. Hardware.**—All required exitways shall be equipped with self-releasing panicproof latches or bolts of an approved type complying with section 614.4.2.

**18.2.8. Width of Exitway Doors.**—Exitway openings shall be at least thirty-six (36) inches wide for single doors and at least sixty-six (66) inches but not more than eighty-eight (88) inches wide for the doors swinging in pairs, except that in assembly spaces having an occupant load of over three hundred (300) persons, single door openings shall be at least forty-four (44) inches wide.

**18.2.9. Exitway Lights.**—All exitway doors shall be marked with illuminated signs complying with section 626 which shall be kept lighted at all times during occupancy of the building.

### **18.3. Theatre Type Seating.**

**18.3.1. Fixed Seats.**—In all theatres and similar places of assembly except churches, stadiums and reviewing stands, individual fixed seats shall be provided with an average width of not less than twenty (20) inches and no seat less than nineteen (19) inches wide. All seats shall be provided with separating arms and arranged in rows not less than thirty-three (33) inches apart, back to back, measured horizontally. The spacing between the back of one (1) chair in any row and any part of the chair in the row behind it, including arm blocks, when the seat is in the lift-up position for automatic operation and in the horizontal position for non-lift-up or nonautomatic operation, when measured horizontally between plumb lines, shall be at least twelve (12) inches, and this spacing shall be increased for the following reason:

Where a difference in floor level occurs between any two (2) rows, the spacing shall be increased by one (1) inch where the difference in level is at least six (6) inches but less than eleven (11) inches; by two (2) inches where the difference in level is at least eleven (11) inches but less than seventeen (17) inches; by three (3) inches where the difference in level is at least seventeen (17) inches but less than twenty-three (23) inches;

and by four (4) inches where the difference in level is twenty-three (23) inches and over.

**418.3.2. Continental Seating.**—With Continental seating, the spacing of rows of unoccupied seats shall provide a clear width between rows measured horizontally as follows (automatic or self-rising seats shall be measured in the seat-up position, other seats shall be measured in the seat-down position):

Eighteen (18) inches clear width between rows of eighteen (18) seats or less; twenty (20) inches clear width between rows of thirty-five (35) seats or less; twenty-one (21) inches clear width between rows of forty-five (45) seats or less; twenty-two (22) inches clear width between rows of forty-six (46) seats or more.

**418.3.3. Number of Seats.**—Aisles shall be provided so that no more than seven (7) seats intervene between any seat and the aisle or aisles, except as indicated for continental seating in section 418.3.2 and as follows :

With Continental seating, the number of intervening seats between any seat and an aisle may be increased to forty-nine (49) where exitway doors are provided along each side aisle of the row of seats at the rate of one (1) pair of exitway doors for each five (5) rows of seats. Such exitway doors shall provide a minimum clear width of sixty-six (66) inches.

**418.3.4. Wheel Chair Viewing.**—Performance viewing positions shall be provided for wheel chair persons in accordance with section 418.3.4.1. table 4-3. These positions shall be located so as not to interfere with egress from any row of seats and shall be reachable by means of ramps and/or elevators. Steps shall not be allowed in the line of travel from the main approach entry to the designated locations.

**418.3.4.1. Table 4-3 Wheel Chair Viewing Positions**

Capacity of Assembly Space	Number of Viewing Positions
75 to 500 .....	Minimum 2
501 to 1000 .....	Minimum 3
1001 to 1500 .....	Minimum 4
Over 1500—Minimum 4 plus 1 for each 400 over 1500	

**418.3.5. Box Seats.**—In boxes or loges with level floors, the seats need not be fastened when not more than fourteen (14) in number.



**418.4. Aisles.**—Every portion of any assembly building which contains seats, tables, displays, equipment or other materials shall be provided with aisle leading to exitways as follows:

**418.4.1. Longitudinal Aisles.**—The width of longitudinal aisles at right angles to rows of theatre type seats and with seats on both sides of the aisle shall be not less than three (3) feet six (6) inches, increasing one and one-half (1½) inches for each five (5) feet in length toward the exitway, cross aisle, or foyer. The width of the longitudinal aisle with banks of seats on one side only shall be not less than thirty-six (36) inches, increasing one and one-half (1½) inches for each five (5) feet in length toward the exit, cross aisle, or foyer. Minimum widths shall be measured at the point farthest from an exitway, cross aisle, or foyer.

**418.4.2. Cross Aisles.**—When there are twenty-seven (27) or more rows of seats on the main floor of theatres, cross aisles shall be provided so that no block of seats shall have more than twenty-two (22) rows. The width of such cross aisles shall not be less than the sum of the required width of the widest aisle plus fifty (50) per cent of the total required width of the remaining aisles which it serves; but no cross aisle shall be less than forty-two (42) inches wide, or when bordering on means of entrance not less than forty-eight (48) inches wide. In balconies and galleries of theatres, one or more cross aisles shall be provided when there are more than ten (10) rows of seats.

**418.4.3. Gradient.**—Aisles shall not exceed a gradient of one (1) foot of rise in eight (8) feet of run.

**418.4.4. Balcony Steps.**—Steps may be provided in balconies and galleries only, and such steps shall extend the full width of the aisle with treads and risers complying with article 6, which shall be illuminated by lights on both sides or by a step light or otherwise to insure an intensity of not less than one (1) foot candle.

**418.4.5. Railings and Protective Guards.**—Metal or other approved noncombustible railings or protective guards shall be provided on balconies and galleries as herein provided:

- a. A railing or protective guard at least thirty (30) inches high above the floor shall be provided along the fascia of all balconies, loges, and boxes, except that the guard shall be at least thirty-six (36) inches high at the bottom of stepped aisles. When rails or other parts of such

guards are designed with ledges more than two and one-half (2½) inches wide, the top surface of the ledges shall slope down toward the seating area at an angle of at least thirty (30) degrees from the horizontal. The guards shall provide an unperforated curb or toeguard at least twelve (12) inches high above the level of the floor of the balcony, loge, or box.

- b. Railings and protective guards at least thirty (30) inches high above the floor shall be provided at cross aisles where fixed seat backs of any adjacent lower level do not project at least twenty-four (24) inches above the cross aisle level.
- c. Where seatings are arranged in successive tiers, and the height of rise between platforms exceeds eighteen (18) inches, a railing or protective guard, not less than twenty-six (26) inches in height along the entire row of seats at the edge of the platform, shall be used.
- d. Guards shall be designed to meet the load requirements for railings in article 7.

#### **418.5. Theatre Foyers.**

**418.5.1. Capacity.**—Adjacent to the main floor and to each balcony, if any, of every theatre or similar place of public assembly for theatrical use with stage and scenery loft, not including churches, and except in the first story, there shall be a foyer, consisting of a lobby, corridor, or passageway, one or more, with an aggregate net floor area exclusive of stairs and landings of not less than one (1) square foot for each occupant of the main floor or balcony thus served (non-comulative). One such area may serve two or more main floors or balconies on the same level if large enough for the largest two occupancy loads served. A main floor with a balcony seating of not more than one hundred and fifty (150) persons may have a common foyer. The use of foyers and lobbies and other available spaces for harboring occupants until seats become available shall not encroach upon the clear floor area herein prescribed or upon the required clear width of front exitways.

**418.5.2. Egress.**—When the foyer is not directly connected to the public street through the main lobby, an unobstructed corridor or passageway shall be provided, which leads to and equals in minimum width the required width of main entrances and exitways.

**418.5.3. Gradient.**—The rear foyer shall be at the same level as the back of the auditorium and the exitways leading therefrom shall not have a steeper gradient than one (1) foot in eight (8) feet.

**418.5.4. Construction.**—The partitions separating the foyer from the auditorium and other adjoining rooms and spaces of theatres shall be constructed of not less than two (2) hour fireresistance; except that opening protectives may be constructed of noncombustible materials without fireresistance rating.

**418.5.5. Waiting Spaces.**—Waiting spaces for harboring occupants shall be located only on the first or auditorium floor. Separate means of egress in addition to the required theatre means of egress shall be provided from the waiting space based on an occupancy of one (1) person for each three (3) square feet of waiting space area.

## **418.6. Theatre Stage Construction.**

**418.6.1. Stage Enclosure Walls.**—Except as provided for in section 418.9.6, every stage hereafter erected or altered for theatrical performances which is equipped with portable or fixed scenery, lights and mechanical appliances, shall be enclosed on all sides with solid walls of not less than four (4) hour fire-resistance, extending continuously from foundation to at least four (4) feet above the roof. There shall be no window opening in such walls within six (6) feet of an interior lot line; and all permissible window openings shall be protected with three-quarter (3/4) hour fire windows complying with article 9.

### **418.6.2. Floor Construction.**

a. In Class F-1a structures the entire stage shall be of not less than three (3) hours fireresistive construction complying with the requirements of section 213.0 except as follows:

1. Any portion of the stage floor used for passing scenery and scenic elements to a lower level may consist of heavy timber construction supporting tight fitting traps of at least three (3) inches nominal solid wood or of equivalent materials in terms of fireresistance, strength, and stiffness properties. Stage lifts shall comply with the provisions of article 13. Any portion of the stage floor that is equipped with stage lifts shall be of noncombustible con-

struction. Joints between lift platforms and adjacent floors will be tightly fitted.

2. Finish flooring shall comply with the provisions of section 922.1.2 table 9-4, article 9.

b. In Class F-1b structures, raised platforms may be built as stages when they are supported on floors having the fireresistance ratings required by section 221.1 table 2-1 and section 213.0, in accordance with the following:

1. The area below the platform shall be enclosed on all sides with solid construction.

2. The horizontal area of stage construction shall not exceed the following:

	Maximum area
Wood frame	400 square feet
Fire retardant treated wood	1,200 square feet
Noncombustible frame	unlimited

3. The floor of the stage, when wood is used, shall be at least one (1) inch nominal thickness, and shall be laid on a solid, noncombustible backing, or all spaces between supporting members shall be fire-stopped with noncombustible material.

**418.6.3. Roofs and Rigging Lofts.**—The roof over the stage in Class F-1a structures shall be of not less than three (3) hour fireresistive construction. The rigging loft, fly galleries and pin rails need not be fire protected, but shall be constructed of approved noncombustible materials.

**418.6.4. Footlights and Stage Electrical Equipment.**—Footlights and border lights shall be installed in troughs constructed of noncombustible materials. All electrical equipment shall conform to the requirements of article 15. The switchboard shall be so located as to be accessible at all times and shall be fully protected from falling objects and the storage or placing of stage equipment against it shall be prohibited.

**418.6.5. Stage Means of Egress.**—At least one (1) approved means of egress shall be provided from each side of the stage and from each side of the space under the stage, and from each fly gallery and from the gridiron to a street, exitway court or passageway to a street. An iron ladder shall be provided from the gridiron to a scuttle in the stage roof. All required exitway openings to the outer air shall be protected with approved self-closing fire doors, complying with article 9. All exterior openings which are located on the stage for egress or loading

and unloading purposes which are likely to be open during occupancy of the theatre, shall be constructed with vestibules to prevent air draughts into the auditorium. In Class F-1a structures, at least two (2) means of egress, remote from each other, shall be available from every point on a stage, each within a travel distance limitation of one hundred and twenty-five (125) feet. The occupant load of the stage shall be based upon one (1) person per fifteen (15) square feet for the performing area and on one (1) person per fifty (50) square feet for the remaining area. When any portion of a stage is used for audience seating at any time, means of egress of adequate capacity shall be provided for that portion, within the travel distance limitations for assembly space seating. Exitway openings serving a stage directly shall have a capacity of seventy-five (75) persons per unit of exit width. In Class F-1b structures, at least two exitways, remote from each other shall be available from every point on a stage, each within a travel distance limitation of one hundred and fifty (150) feet. The occupant load of the stage shall be based upon one (1) person per twenty-five (25) square feet of area. When any portion of a stage is used for audience seating at any time, means of egress of adequate capacity shall be provided for that portion within the travel distance limitations for assembly space seating. Exitway openings serving a stage directly shall have a capacity of one hundred (100) persons per unit of egress width.

**418.6.6. Proscenium Wall.**—There shall be no other openings in the wall separating the stage from the auditorium except the main proscenium opening; two (2) doorways at the stage level, one (1) on each side thereof; and, where necessary, not more than two (2) doorways to the musicians pit from the space below the stage floor. Each such doorway shall not exceed twenty-one (21) square feet in area and shall be protected with approved automatic and self-closing fire door assemblies complying with article 9 with a combined fireresistance rating of three (3) hours or the approved labeled equipment.

**418.6.7. Proscenium Curtain.**—When stage ventilation is provided for by means other than emergency exhaust fans, the proscenium opening shall be protected with an automatic fireresistive and smoke-tight curtain designed to resist an air pressure of not less than ten (10) pounds per square foot normal to its surface, both inward and outward. The curtain shall withstand a one-half (1/2) hour fire test at a temperature of not

less than seventeen hundred (1700) degrees F. without the passage of flame. The curtain shall be operated by an automatic heat activated device to descend instantly and safely and to completely close the proscenium opening at a rate of temperature rise of fifteen (15) to twenty (20) degrees F. per minute; and by an auxiliary closing of the proscenium opening. When stage ventilation is provided for by emergency exhaust fans, the proscenium curtain shall have fireresistive properties conforming with the requirements of article 9. No curtain shall be located between the audience area and the stage unless it is designed to permit the air movement that is required for the operation of the emergency exhaust fan stage ventilation system to bypass or pass through the curtain without excessive billowing. Motion picture screens shall be noncombustible, or have a flame spread rating not over twenty-five (25), or be of materials that have been rendered flameproof in accordance with the provisions of article 9. The construction supporting screens shall be noncombustible, and shall comply with the requirements of article 7. When the provisions of section 418.9.6 are followed, there are no requirements for a proscenium curtain.

**418.6.8. Deleted.**

**418.6.9. Stage Ventilation.**—Stage ventilation shall be provided by either of the following systems:

- a. Metal or other approved noncombustible ventilators, equipped with movable shutters or sash shall be provided over the stage, constructed to open automatically and instantly by approved heat activated devices, with an aggregate clear area of opening not less than one-eighth (1/8) the area of the stage, except as otherwise provided in section 418.1.2. Supplemental means shall be provided for manual operation of the ventilator.
- b. Emergency ventilation shall be provided for all stages in F-la places of assembly to provide a means of removing smoke and combustion gases to the outdoors in the event of a fire, as follows:
  1. A mechanical exhaust system shall be provided of sufficient capacity to exhaust an amount of air at least equal to the sum of the following:
    - 2 cfm per square foot of the performing area.
    - 4 cfm per square foot of that portion of stage area that is not designated as performing area.
    - 4 cfm per square foot of rigging loft area.

2. The exhaust system shall be activated both manually and automatically, manual operation shall be by means of a manually operated switch located at the fire control station as required by section 418.9.6 and adjacent to at least one means of egress from the stage. Such means of egress shall be remote from the fire control station. Automatic activation shall be by means of the sensing devices that start the operation of the sprinklers. Exhaust air openings of ducts shall be located so as to provide the most effective removal of smoke and combustion gases.
3. The exhaust system shall be provided with an automatic emergency by-pass damper in the exhaust duct on the suction side of the fan. Such damper shall close to the fan in the event of a power failure to the fan motor and shall open directly to the outdoors if the fan is located outside the building, or shall open to a duct leading directly to the outdoors if the fan is located inside in the building. When located inside the building, the fan shall be insulated with a minimum of one (1) inch magnesia block or the equivalent in insulating and fireresistive qualities. Exhaust fans shall have drive and bearings located outside of the fan impeller housing. The exhaust system shall not be connected to exhaust openings in any space other than the stage or rigging loft, and shall be constructed to comply with the provisions of article 18. All switches shall be clearly labelled "emergency stage ventilation" and shall be painted red.
4. The emergency ventilation system shall be connected to both the normal and emergency light and power circuits.

**418.7. Auxiliary Stage Spaces.**—Auxiliary stage spaces such as understage areas, dressing rooms, green rooms, storage room, work shops, and similar spaces associated with the use of the stage shall be of fireproof (type 1) construction and shall be separated from the stage and all other parts of the building by walls of not less than three (3) hour fireresistance and the requirements herein prescribed.

**418.7.1. Understage Areas.**—When the stage floor is equipped with traps or stage lifts, the room or space below the stage

into which the traps or lifts open shall be completely enclosed by construction having at least the fireresistance rating required for the stage floor, and such room or space shall not be used as a workshop or storage area. Storage shall not be deemed to include the location in this area of scenery or scenic elements used during a performance. However, no combustible material that has a flame-spread rating greater than twenty-five (25) or that has not been rendered flame-proof in accordance with article 9 of this code may be stored in this location at any time.

**418.7.2. Exitway Access.**—No point within any auxiliary stage space shall be more than fifty (50) feet from a door providing access to an exitway.

**418.7.3. Number of Means of Egress.**—There shall be at least two (2) independent means of egress available from every auxiliary space, one (1) of which shall be available within a travel distance of seventy-five (75) feet. A common path of travel of twenty (20) feet to the two (2) exitways shall be permitted.

**418.7.4. Occupant Load.**—The occupant load of dressing rooms shall be based on one (1) person per fifty (50) square feet of area.

**418.7.5. Sprinklers.**—Auxiliary stage spaces shall be equipped with automatic sprinklers installed in conformance with the provisions of article 12.

**418.7.6. Combustibles.**—No workshop involving the use of combustible or inflammable paint, liquids, or gases or their storage shall open directly upon a stage.

**418.7.7. Interior Finish.**—The interior finish of auxiliary stage spaces shall comply with the requirements of article 9.

**418.7.8. Opening Protectives.**—Openings and necessary doorways at stage level connecting such rooms with the stage shall be protected with one and one-half (1-1/2) hour self-closing fire doors or the approved labeled equivalent complying with article 9.

**418.8. Lighting.**—During occupancy, all places of assembly shall be lighted to comply with the requirements of section 627, or as herein prescribed.

**418.8.1. Aisles.**—Aisles or cross aisles shall be provided at all times with at least one-half (1/2) foot candle of artificial illumination by electrical means.



**418.8.2. Other Places of Public Assembly.**—All areas and portions of buildings used as places of public assembly other than theatres shall be lighted by electric light to provide a general illumination of not less than five (5) foot candles.

**418.8.3. Exitway Lighting.**—In addition to the requirements of article 6, lighting shall be provided in the following areas:

- a. **Foyers and Waiting Spaces.**—Foyers and waiting spaces shall be artificially lighted by electrical means at all times during occupancy of a place of assembly so as to provide all illumination of at least five (5) foot candles at the level of the floor and on the surface of all stairs, steps, ramps, and escalators within the foyers and waiting spaces.
- b. **Open Exterior Spaces.**—Yards or courts which serve as open exterior spaces shall be artificially lighted by electrical means at all times between sunset and sunrise during occupancy of a place of assembly so as to provide illumination of at least five (5) foot candles at the level of the floor over at least the required area.

**418.8.4. Control.**—The lighting of exitways, aisles and auditoriums shall be controlled from a location inaccessible to unauthorized persons. Supplementary control shall be provided as specified in section 409.3.4. in the motion picture projection room.

**418.8.5. Emergency Lighting.**—All assembly spaces shall be provided with emergency lighting facilities sufficient to provide at least five (5) foot candles of illumination at the floor level. Such lighting shall be on circuits that are separate from the general lighting and power circuits, either taken off ahead of the main switch or connected to a separate emergency lighting power source, and be arranged to operate automatically in the event of failure of the normal lighting system.

**418.9. Fire Protection and Fire Fighting Equipment.**—Every theatre-type structure classified in the F-1 occupancy group shall be equipped with fire-extinguishing equipment complying with the requirements of article 12 and as herein specified.

**418.9.1. Sprinkler System.**—Approved automatic sprinkler systems complying with the provisions of section 1213, 1214, and as herein noted for Class F-1a structures shall be provided to protect all parts of the building except the auditorium, foyers and lobbies or in the immediate vicinity of automatic equipment or over dynamos and electric equipment. Such pro-

tection shall be provided above all rigging lofts over the stage, under the gridiron, under all fly galleries, in dressing rooms, over the proscenium opening on the stage side, under the stage, in all basements, cellars, work rooms, store rooms, property rooms and in toilet, lounge and smoking rooms. Sprinklers above rigging lofts shall be located so that no gridiron or other obstruction intervenes between the sprinkler heads and the scenery or scenic elements.

**418.9.2. Standpipes.**—Standpipe fire lines complying with the provisions of sections 1207 and 1208 shall be provided with outlets and hose attachments one on each side of the auditorium in each tier; one on each side of stage; and protecting each property, store, and work room.

**418.9.3. Hose Outlets.**—A sufficient quantity of hose shall be provided, equipped with regulation fire department couplings, nozzle and hose spanner, to reach all areas as specified in article 12.

**418.9.4. First-Aid Hand Equipment.**—Approved portable two and one-half (2-1/2) gallon fire extinguishers shall be provided and located as follows: two (2) on each tier or floor of the stage; one (1) immediately outside of the motion picture projection room; one (1) in each dressing room; and one (1) in each work, utility and storage room. Fire axes and firehooks shall also be provided as directed by the fire official; and all fire extinguishers and fire tools shall be securely mounted on walls in plain view and readily accessible.

**418.9.5. Vertical Water Curtains.**—A deluge sprinkler system designed to form a vertical water curtain that completely separates the audience areas from stage areas and rigging lofts may be substituted for the enclosure requirements of section 418.6.1. and the curtain requirements of section 418.6.7 when constructed as follows:

- a. Stage areas and rigging lofts totally sprinklered in accordance with section 418.9.1. shall be completely separated from audience area by a vertical water curtain with sprinkler heads spaced to provide a water density of at least three (3) gpm per linear foot. The water curtain system shall be controlled by a deluge valve actuated by a “rate of rise system” and “fixed temperature system.” The heat actuating devices shall be located on not more than ten (10) foot centers around the perimeter of the sprinklered area or as otherwise required

for the type of device used to assure operation of the system. In addition to the automatic controls, manual operating devices shall be located at the first control station as required by section 418.9.7. below and adjacent to at least one (1) exitway from the stage. Such exitway shall be remote from the fire control station.

- b. When openings are provided in the stage floor for stage lifts, trap doors or stairs, sprinklers spaced five (5) feet on centers shall be provided around the opening at the ceiling below the stage, and baffles at least twelve (12) inches in depth shall be installed around the perimeter of the opening.
- c. All valves controlling sprinkler supplies shall be provided with tamper switches wired to an annunciator panel located at the fire control station.
- d. The operation of any section of the sprinkler system and the deluge system shall activate the emergency ventilating equipment required in section 418.6.9.
- e. The water flow alarm, tamper switches and deluge system equipment shall be provided with central station supervision in addition to the required local alarm.

**418.9.6. Emergency Control Panel.**—In Class F-1a structures, an emergency control panel shall be provided, as follows:

- a. It shall be located on or adjoining the stage, except that where the stage is surrounded by seating, it shall be located so as to permit a view of the audience and stage areas. It shall be manned in accordance with the requirements of the fire department at all times during the presentation of a performance to an audience.
- b. It shall be equipped with tell-tale lights to indicate when feeders and sub-feeders of emergency light and power circuits are in operation in assembly spaces, and all exitways, including foyers and waiting spaces.
- c. It shall, when a deluge type sprinkler system is provided, be equipped with manual operating devices to activate the sprinkler system. It shall also be provided with a signal system to show when any portion of the sprinkler system has been deactivated.
- d. It shall be provided with switches to provide for operation of the emergency ventilating system. Controls for the ventilating system shall be electrically supervised. The supervisory circuit shall be provided with a trouble

bell and light, both of which shall be activated in the event of a failure in the ventilation system. A silencing switch may be provided, and where provided, shall have either an automatic reset or shall ring again when the trouble is corrected.

- e. It shall be equipped with a public address system serving loudspeakers in the assembly space. The public address system shall be connected to both the normal and emergency light and power circuits.
- f. It shall be equipped with an alarm system and intercom connected to the manager's office, the dressing rooms, and to a supervisory central fire station.

In Class F-1b structures having an occupant load over six hundred (600) persons, an emergency control panel shall be provided, as follows:

- a. It shall be located so as to have a view of the audience and stage areas, and shall be manned during the presentation of a performance to an audience, by a competent person instructed in its use.
- b. It shall be equipped with tell-tale lights to indicate when feeders and sub-feeders of emergency light and power circuits are in operation in assembly spaces and all exitways, including foyers and waiting spaces.
- c. It shall be equipped with a public address system serving loudspeakers in the assembly space. The public address system shall be connected to both the normal and emergency light and power circuits.

## **SECTION 419.0. PUBLIC ASSEMBLY OTHER THAN OCCUPANCY GROUP F-1**

Other places of public assembly including exhibition halls, armories, bowling alleys, broadcasting studios, chapels, churches, community houses, dance halls, gymnasiums, lecture halls, museums, night clubs, rinks, roof gardens and similar occupancies shall comply with the general means of egress requirements of article 6 and the applicable requirements of section 418, except as otherwise provided for in sections 418.4.5 and 418.5.4 or as herein specifically exempted. Places of public assembly which are equipped with a stage, movable scenery, scenery loft and dressing rooms shall comply with all the requirements of section 418 for occupancy group F-1.

**419.1. Number of Exitways.**—Every tier, floor level and story of places of public assembly shall be provided with the mini-

imum number of required, approved exitways, as provided for in sections 418.1.4, 418.2 and the applicable subsections of section 418.2.

**419.2. Aisles With Fixed Seats.**—All rows of seats shall be individually fixed or fixed in rigid units between longitudinal aisles complying with sections 418.3 and 418.4 except as provided for chapels and churches in which the minimum side aisle width shall be thirty-six (36) inches. Where permitted, continuous fixed benches shall comply with the provisions of section 421.7.

**419.3. Aisles Without Fixed Seats.**—Tables and chairs in all rooms and spaces for public assembly shall provide convenient access by unobstructed aisles not less than thirty-six (36) inches wide which lead to required exitways complying with article 6. Tables and chairs shall be so arranged that the distance from any chair at any table by way of a path between tables and chairs is not greater than eighteen (18) feet to an aisle leading to an exitway. The width of the path shall be at least eighteen (18) inches; except that it may be reduced by one (1) inch for each one (1) foot that the distance to the aisle is less than eighteen (18) feet, but may not be reduced to less than twelve (12) inches. Chairs, when placed with the front edge of the seat on a line with the edge of the table, shall not protrude into this path. Booths containing up to eight (8) seats may be used, provided they open directly on an aisle.

**419.6. Kitchen and Service Pantries.**—Where kitchen and service pantries are provided, they shall be separately enclosed in partitions, floors and ceilings of not less than one (1) hour fire-resistance, except for opening protectives; and no required exitway shall pass through such areas.

**419.7. Bowling Alleys.**—The storage and use of all volatile flammable liquids shall comply with section 403 and the finishing rooms shall be separately enclosed in two (2) hour fire-resistive construction with floor finish of concrete or other noncombustible, nonabsorbent material. Finishing rooms shall not be permitted in areas below grade.

**419.8. Skating Rinks.**—No skating rinks shall be located below the floor nearest grade.

**419.9. Exhibition Type Areas.**—When a building or a portion of a structure exceeding fifteen thousand (15,000) square feet in area is used as an exhibition hall, museum or other occupancy group F-3 occupancy for the display or sale of com-

bustible products, goods or materials, or having combustible display equipment either on a temporary or permanent basis the following requirements shall apply.

**419.9.1. Sprinklers.**—An approved automatic sprinkler system complying with the provisions of sections 1213 and 1214 shall be installed throughout the exhibit space and accessory areas.

**419.9.2. Draft Curtains.**—Draft curtains and emergency smoke and heat venting equipment shall be installed in accordance with the provisions of reference standard RS4-22.

**419.9.3. Fan Requirements.**—Fans in air-handling systems serving these areas shall be arranged to shut down automatically when the temperature of the air in the system becomes abnormally high in accordance with the provisions of reference standard RS4-23.

**419.9.4. Means of Egress.**—The arrangement of temporary partitions or booths shall not obstruct any exitway and shall not increase the access to exitway travel distance from any part of the exhibition floor. Means of egress routes shall be clearly marked and not obscured.

## **SECTION 420.0. OMITTED**

## **SECTION 421.0. OMITTED**

## **SECTION 422.0. DRIVE-IN MOTION PICTURE THEATRES**

The location of drive-in motion picture theatres shall be approved by the City of Boston authority having jurisdiction thereof.

**422.1. Arrangement of Lanes.**—Separate entrance and exitway lanes shall be provided not less than twelve (12) feet in width, with not less than forty (40) foot intervals between access lanes. The parking space for each car shall not be less than nine (9) feet by twenty (20) feet in area, and so arranged to provide continuous lanes of travel.

**422.2. Projection Booth.**—The projection booth shall comply with sections 409.3 and 409.4 and shall be supported on a structure of type 2-C or other approved noncombustible construction. No motor vehicle shall be permitted to park within twenty (20) feet of the projection booth or room.

**422.3. Projection Screens.**—Projection screens and supporting structures shall comply with the requirements of section 418.6.7. and shall be designed in accordance with the requirements of

article 7 as applied to signs. Motor vehicle parking spaces shall not be closer than twenty (20) feet to any projection screen.

**422.4. Toilet Facilities.**—Separate toilet facilities shall be provided for each sex as required in article 17 for places of public assembly.

**422.5. Fire Protection.**—Sufficient approved portable fire extinguishers shall be provided in readily accessible locations, plainly and visibly identified by signs, at distances of not more than one hundred and fifty (150) feet so as to be available to every motor vehicle as directed by the fire official. The fire extinguishers shall be mounted on posts or platforms protected from mechanical injury with substantial guards as approved by the building official.

## **SECTION 423.0. OMITTED**

## **SECTION 424.0. PARKING LOTS**

This section shall apply to the construction, alteration, and use of open parking lots. Open parking lots shall be unobstructed and free of other uses.

**424.1. Curb Cuts.**—Parking lots shall be arranged to afford ready means of entrance and exit at sidewalk level; and special permits shall be secured for curb cuts from the administrative authorities. For the purposes of this section, a curb cut shall be defined as the total length of cut curb, including splays.

**424.1.1. Street Frontage.**—For street frontages of one hundred (100) feet or less, the amount of cut curb shall not exceed sixty (60) per cent of the frontage of the lot. No single curb cut shall exceed thirty (30) feet in length, and there shall not be more than two curb cuts on any street frontage of one hundred (100) feet or less. The minimum distance between two curb cuts shall be five (5) feet. For additional street frontage over one hundred (100) feet there may be an additional curb cut for each fifty (50) feet of frontage.

**424.1.2. Distance From Lot Lines.**—No curb cut shall commence within eight (8) feet of a side lot line, except that on lots with street frontages of fifty (50) feet or less, or on corner lots, the curb cut may commence two (2) feet, six (6) inches from the side lot line.

**424.1.3. Distance From Intersections.**—The distance of curb cuts from the intersection of street lines shall comply with the zoning resolution.

**424.1.4. Limit.**—Notwithstanding any of the above computations, no curb cut shall be less than ten (10) feet.

**424.2. Lanes and Parking Spaces.**—Access lanes shall be provided for each row of cars not less than twelve (12) feet in width; and the parking space shall be not less than eight (8) feet by eighteen (18) feet in area for each motor vehicle.

**424.3. Parking Lot Offices.**—Parking lot offices, attendant shelters, storage facilities, and similar structures used in conjunction with open parking lots may be provided for accessory use, but shall comply with the fire district limitations of section 303.

**424.4. Protection of Adjoining Property.**—Open parking lots shall be completely separated from adjoining land by curbs or bumpers of concrete, masonry, steel, heavy timber, or other similar and equally substantial materials, securely anchored so as to stop motor vehicles. Curbs and bumpers shall be at least eight (8) inches high and eight (8) inches wide. The only openings permitted in required curbs and bumpers shall be for drainage and for motor vehicle entrances and exits, and at pedestrian entrances.

**424.5. Surface and Drainage.**—All driveways and open spaces used for the parking or storage of motor vehicles shall be surfaced with concrete asphalt, or equivalent durable, dustless materials. Where the surface paving of an open parking lot is nonporous, such lot shall be drained to dry wells or a storm water system. An asphaltic concrete surface, not to exceed one and one-half (1-1/2) inches in thickness after compaction, shall be considered a porous surface provided such surface will pass an amount of water equivalent to one-half (1/2) inch of rainfall per hour. Parking lots graded with rolled or compacted cinders, gravel or other approved nonabsorbent materials to prevent raising of dust shall be maintained to prevent drainage onto adjoining property or the sidewalk.

**424.6. Electric Illumination.**—Electric light wiring shall be provided on approved standards to furnish adequate automatic illumination of driveways and lanes as required by the municipal authorities for street lighting, but in no case shall such illumination be less than one-tenth (1/10) of one (1) watt per square foot of parking area.



**424.7. Fire Protection.**—Fire protection shall be provided in accordance with pertinent regulations of the Fire Department of the City of Boston.

**424.8. Sidewalk Protection.**—Suitable barriers subject to the approval of the building official shall be erected where required to prevent encroachment of vehicles upon abutting sidewalks or other public ways.

**SECTION 425.0. OMITTED**

**SECTION 426.0. OMITTED**

**SECTION 427.0. OMITTED**

**SECTION 428.0. OMITTED**

**SECTION 429.0. SWIMMING POOLS**

**429.1. General.**—Pools used for swimming or bathing shall be in conformity with the requirements of this section, provided, however, these regulations shall not be applicable to any such pool less than twenty-four (24) inches deep or having a surface area less than two-hundred and fifty (250) square feet, except when such pools are permanently equipped with a water recirculating system or involves structural materials. For purposes of this code, pools are classified as private swimming pools or public and semi-public swimming pools, as defined in section 429.2.

Materials and constructions used in swimming pools shall comply with the applicable requirements of this Code.

Pools used for swimming or bathing and their equipment or accessories which are constructed, installed and maintained in accordance with reference standard RS4-19 shall be deemed to conform to the requirements of this Code, provided the requirements of section 429.8 and Article VI of the Sanitary Code of the Commonwealth of Massachusetts, Department of Public Health are included in the installation.

**429.2. Classification of Pools.**—Any constructed pool which is used, or intended to be used, as a swimming pool in connection with a single family residence and available only to the family of the householder and his private guests shall be classified as a private swimming pool.

Any swimming pool other than a private swimming pool shall be classified as a public or semi-public swimming pool.

### **429.3. Plans and Permit.**

**429.3.1. Permits.**—No swimming pool or appurtenances thereto shall be constructed, installed, enlarged or altered until a permit has been obtained from the building official. The approval of all city, and state authorities having jurisdiction over swimming pools shall be obtained before applying to the building official for a permit. Certified copies of these approvals shall be filed as part of the supporting data for the application for the permit.

**429.3.2. Plans.**—Plans shall accurately show dimensions and construction of pool and appurtenances and properly established distances to lot lines, buildings, walks and fences; details of water supply system, drainage and water disposal systems, and all appurtenances pertaining to the swimming pool. Detail plans of structures; vertical elevations; and sections through the pool showing depth shall be included.

**429.4. Locations.**—Private swimming pools shall not encroach on any front or side yard required by this code or the zoning code. No wall of a swimming pool shall be located less than six (6) feet from any rear or side property line or ten (10) feet from any street property line.

**429.5. Design and Construction.**—Pools shall be constructed so as to be water tight and easily cleaned. They shall be built of approved non-absorbent materials with smooth white or light colored surfaces and shall be free of open cracks and open joints. All corners at the juncture of pool walls and pool floor shall be coved with a maximum radius of six (6) inches at depths less than five (5) feet and with a maximum radius of three (3) feet less than the depth of the pool at the point in question, for depths greater than five (5) feet.

**429.5.1. Structural Design.**—The pool structure shall be engineered and designed to withstand the expected forces to which it will be subjected, in conformance with the requirements of article 7.

**429.5.2. Wall Slopes.**—The side and end walls of all artificial and semi-artificial pools shall be vertical and shall have a safety ledge at the deep end of the pool, located at a level four (4) feet six (6) inches below the surface of the water. Safety ledges shall be four (4) inches wide, sloping one quarter (1/4) inch toward the pool.

**429.5.3. Floor Slopes.**—The slope of the floor on the shallow side of transition point shall not exceed one (1) foot vertical to twelve (12) feet horizontal. The transition point between shallow and deep water shall not be more than five (5) feet deep. There shall be no break in slope on the shallow side of the transition point.

**429.5.4. Surface Cleaning.**—All swimming pools shall be provided with a recirculating skimming device or overflow gutters to remove scum and foreign matter from the surface of the water, in conformance with Article VI of the Commonwealth of Massachusetts, Department of Public Health Sanitary Code.

**429.5.5. Walkways.**—Walkways shall be continuous around the pool with a minimum width of four (4) feet of unobstructed clear distance including a curb at the pool edge, if such curb is used. Walkways of a width of eight (8) feet are desirable. A minimum of three (3) feet walk width shall be provided around any piece of diving equipment. All walks, decks, and terraces shall have a minimum slope of one-quarter (1/4) inch per foot toward adequate drains or points at which the water will have a free unobstructed flow to approved points of disposal at all times.

**429.5.6. Steps and Ladders.**—Steps or ladders for entering and leaving the pool shall be of such construction as to minimize danger of accidents. Except in a flush deck pool, a minimum of one (1) ladder shall be provided for each seventy-five (75) feet of swimming pool perimeter, and not less than two such devices shall be provided at any pool. At least one shall be provided at the shallow end of the pool. Step holes inserted into the pool wall shall not be permitted. Stairways shall not project into the pool, but shall be recessed into the wall and walkway of the pool, except when not exceeding four (4) in number and extending the full length of any side of the pool. Ladders shall have an approved handrail on each side leading out over the walkway. Stairways shall have an approved handrail at one side or in the center of the stairstep except that handrails may be omitted when there are not more than four (4) steps in number or extending the full length of any side. Handrails and treads of ladders or stairs shall be of an approved non-slip material.

**429.5.7. Markings.**—In addition to the requirements of Article VI of the Commonwealth of Massachusetts Department of Public Health Sanitary Code, pool markings shall be as herein

prescribed. Swimming lanes shall be marked on the bottom with dark colored material of the same kind as the pool lining. The outlet of the pool shall be plainly marked by a black or dark colored circle or by the use of a conspicuously colored outlet grating. The depth of water at the deepest point and at the five (5) foot point shall be conspicuously marked on both sides of a pool with deep water at one end. In large pools with deep water only in the middle, the three (3) and five (5) foot depth lines shall be conspicuously marked on the bottom, and portions of the area may also be designated by surface floats.

**429.6. Water Supply, Treatment and Drainage Systems.**—All water supply, treatment and drainage systems shall conform to the requirements of Article VI of the Sanitary Code, Department of Public Health, Commonwealth of Massachusetts.

**429.7. Appurtenant Structures and Accessories.**—All appurtenant structures and accessories shall comply with the requirements of Article VI of the Commonwealth of Massachusetts, Department of Public Health, Sanitary Code as well as herein prescribed.

**429.7.1. Appurtenant Structures.**—All appurtenant structures, installation, and equipment, such as showers, dressing rooms, equipment houses or other buildings and structures, including plumbing, heating and air conditioning, amongst other appurtenant to a swimming pool, shall comply with all applicable requirements of this code and the zoning laws of the City of Boston.

**429.7.2. Accessories.**—All swimming pool accessories shall be designed, constructed, and installed so as not to be a safety hazard. Installations or structures for diving purposes shall be properly anchored to insure stability, and properly designed and located for maximum safety.

**429.8. Safety Precautions.**

**429.8.1. Electrical Safety.**—The construction and installation of electric wiring for equipment in or adjacent to swimming pools, to metallic appurtenances in or within five (5) feet of the pool, and to auxiliary equipment such as pumps, filters, and similar equipment shall conform to article 680 of the Massachusetts Electric Code, Form FPR-11.

**429.8.2. Equipment Installations.**—Pumps, filters, and other mechanical and electrical equipment for public and semi-public swimming pools shall be enclosed in such a manner as to be

accessible only to authorized persons and not to bathers. Construction and drainage shall be such as to avoid the entrance and accumulation of water in the vicinity of electrical equipment.

**429.8.3. Swimming Pool Safety Enclosures.**—Every person owning land on which there is situated a swimming pool, shall erect and maintain thereon an adequate enclosure either surrounding the property or pool area, sufficient to make such body of water inaccessible to small children. Such enclosure, including gates therein, must be not less than four (4) feet above the underlying ground; all gates must be self-latching with latches placed four (4) feet above the underlying ground or otherwise made inaccessible from the outside to small children.

## **SECTION 430.0. OPEN PARKING STRUCTURES**

Open parking structures shall comply with the most restrictive applicable requirements of reference standard RS4-21 and of this section. In addition, the portions of such buildings and structures in which gasoline, oil and similar products are dispensed shall comply with the requirements of section 416; the portions in which motor vehicles are repaired shall comply with section 417; and the portions in which paint spraying is done shall comply with the requirements of section 412.

**430.1. General Requirements.**—Passenger vehicle structures shall be constructed of noncombustible materials throughout, including structural framing floors, roofs and walls. Any enclosed rooms or spaces on the premises shall comply with the applicable requirements of this code. Open passenger vehicle parking structures are those structures used for the parking or storage of passenger motor vehicles designed to carry not more than nine (9) persons.

**430.1.1.** Ramp type parking structures are those employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of passenger automobiles under their own power to and from the street level.

**430.1.2.** Deleted.

**430.1.3.** For special fireresistive requirements, see section 905.0.

**430.1.4.** For exitway requirements, see section 611.5.

**430.1.5.** The minimum clear height of any parking tier shall be at least seven (7) feet.

**430.2. Separations.**—Parking structures may be erected without enclosure walls except that an enclosure wall with not less than two (2) hour fire-resistance, without openings therein, shall be provided when located within fifteen (15) feet of interior lot lines. Open parking structures in buildings of other occupancy group classification shall not be permitted unless separated from other occupancies by construction having at least a two (2) hour fire-resistance rating.

**430.3. Basements.**—Basements and other below grade areas of open parking structures shall comply with the requirements as set forth in section 415.1.2, basements of public garages, and section 905.0.

**430.4. Heights and Areas.**—Heights and areas of open parking structures shall not exceed the limits in the following table, 4-4, except as noted in section 905.2.2.

**430.4.1. Table 4-4 Height and Area Limitation for Open Parking Structures**

<b>Construction Classification</b>	<b>Maximum Allowable Height (Feet)</b>	<b>Allowable Area per Parking Tier (sq. ft.)</b>
1-A	Unlimited	Unlimited
1-B	Unlimited	Unlimited
2-A	100	50,000
2-B	100	50,000

**430.4.2.** The area of an open parking structure having not more than two (2) tiers above grade shall not be limited.

**430.4.3.** The areas of structures wherein more than twenty-five (25) per cent of the perimeter has frontage on street or other open space leading to a street, each of which is not less than thirty (30) feet wide may be increased as provided in section 308.1. The above limits of height permit parking on the roof.

**430.5. Ramps.**—Ramps used for the movement of motor vehicles and as required exits need not be enclosed when serving tiers above grade. Such ramps shall have a gradient not exceeding 1 in 7, with nonslip surfaces. A landing having a minimum dimension of twenty (20) feet shall be provided at the discharge point of all ramps at the street level, within the street line. Where a ramp is also used for the parking of motor vehicles, it shall be considered as a parking tier and may not serve as an exit-way for the occupants of the structure.

**430.6. Elevators.**—Passenger elevators in open parking structures shall comply with the requirements of article 16 except that hoistways may be enclosed with non-combustible construction.

**430.7. Curbs and Bumpers.**—Curbs or bumpers of noncombustible materials shall be provided at the perimeter of each parking tier. Such curbs or bumpers shall be at least twelve (12) inches high, substantially anchored, and so located that no part of any motor vehicle will contact a wall, partition or railing.

**430.8. Railings.**—Substantial railings or protective guards of noncombustible materials shall be provided at the perimeter of all parking tiers, except where exterior walls are provided, and around all interior floor openings. Such railings or guards shall be at least three feet six inches (3'-6") high, and shall be designed in accordance with the requirements of article 7.

**430.9. Floor Openings.**—A curb or ramp at least six (6) inches high shall also be provided at all interior floor openings. All floors shall be pitched to provide adequate drainage.

## **SECTION 431.0. OMITTED**

## **SECTION 432.0. INTER-COMMUNICATING FLOOR LEVELS**

Where necessary for the functional design of the building, any structure other than one classified in occupancy group H-2, Institutional, may be permitted to have a maximum of three (3) communicating floor levels without enclosure or protection between such areas, provided that there is compliance with all of the conditions prescribed within this section and subject to the approval of the building official.

**432.1. Arrangement.**—The arrangement of such levels must be permitted by section 221.2 table 2-2 of this code.

**432.2. Grade.**—The lowest or next to the lowest level is a level accessible from the street, or from outside the building at grade, with floor level at main entrance not more than twenty-one (21) inches above nor more than twelve (12) inches below grade at said main entrance.

**432.3. Unobstructed View.**—The entire area including all communicating floor levels shall be sufficiently open and unobstructed so that it may be reasonably assumed that a fire or other

dangerous condition in any part will be immediately obvious to the occupants of all communicating levels and areas.

**432.4. Exitways.**—Exitway capacity shall be sufficient to provide simultaneously for all the occupants of all communicating levels and areas. All communicating levels in the same fire area shall be considered as a single floor area for purposes of determination of required exitway capacity. Each floor level, considered separately, shall have at least one-half (1/2) of its required exitway capacity provided by exitways leading directly out of that area without traversing another communicating floor level or being exposed to the spread of fire or smoke therefrom.

**432.5. Enclosing Walls.**—The enclosing walls of the space created by the communicating floor levels shall have a fireresistive rating not less than that required for interior exitway stairways, section 618, with approved fire doors or windows provided in openings therein, all so designed and installed as to provide a complete barrier to the spread of fire or smoke through such openings.

## **SECTION 433.0. COVERED MALLS, COVERED WALKWAYS AND TUNNELS**

This section shall apply to connections between buildings such as covered malls, covered walkways and tunnels, located above or below grade level, that are used as a means of travel by persons.

### **433.1. Definitions.**

**433.1.1. Covered Mall.**—A covered or roofed interior area having a minimum horizontal dimension of thirty (30) feet used as a pedestrian public-way and connecting buildings and/or a group of buildings housing individual or multiple tenants.

**433.1.2. Covered Walkway.**—A roofed, unobstructed walkway the least horizontal dimension is less than thirty (30) feet, connecting buildings and used as a means of travel by persons and where less than fifty (50) per cent of the perimeter is enclosed.

**433.1.3. Enclosed Walkway.**—A roofed, unobstructed walkway where the least horizontal dimension is less than thirty (30) feet, connecting buildings and used as a means of travel by persons and where fifty (50) per cent or more of the perimeter is enclosed.

**433.1.4. Tunneled Walkway.**—An unobstructed underground walkway connecting buildings and used as a means of travel by persons.



**433.2. Construction.****433.2.1. Covered Mall. —**

- a. The roof construction and supporting members of a covered mall shall be required to be of a type of construction in accordance with section 221.1 table 2-1 and section 221.2 table 2-2 as permitted for the buildings connected, but not less than one (1) hour or heavy timber construction throughout. All unprotected walls and openings separating a tenant area from the mall area shall be provided with an automatically actuated water curtain unless the tenant area is provided with a complete automatic sprinkler system.
- b. Concealed spaces, when permitted in a mall roof assembly, shall be separated from adjoining buildings by not less than one (1) hour fireresistive construction.
- c. Except where an approved automatic sprinkler system is installed, combination or dry standpipe hose cabinets shall be provided for each two hundred (200) feet of mall length.
- d. Access openings not less than four (4) feet in size in the roof for fire department use shall be provided for each one hundred (100) feet of mall length on each side of the mall.

**433.2.2. Covered Walkway. —** A covered walkway shall be of any type of construction permitted by this Code, provided the walls and openings at the point of connection to the building shall be protected so as to reasonably prevent the spread of fire from one building into the other.

**433.2.3. Enclosed Walkway. —** An enclosed walkway shall be required to be of a type of construction permitted for the buildings connected. Separation between the enclosed walkway and the building to which it is connected, except when used as an exitway outlet, shall be of not less than one (1) hour fireresistive construction, and openings therein shall be protected by a fixed or automatic self-closing fire assembly having a three-fourths (3/4) hour fireresistive rating.

**433.2.4. Tunneled Walkway. —** A tunneled walkway shall be of a type of construction suitable for underground location. Separation between the tunneled walkway and the building to which it is connected shall be not less than two (2) hour fireresistive construction, and openings therein shall be protected by a fire

assembly having a one and one-half (1-1/2) hour fireresistive rating.

**433.3. Transparent or Translucent Roofs.**—In lieu of the roof construction outlined in section 433.2, roofs of covered malls, covered walkways and enclosed walkways may be constructed of noncombustible supporting elements and approved translucent or transparent panels, subject to the limitations herein established and any further requirements of the building official. Wall and opening protection shall be in conformance with section 433.2.

**433.3.1. Structural Requirements.**—All supporting members and paneling shall conform to the requirements of article 7.

**433.3.2. Slope.**—Flat roofs shall not be allowed. Roofs shall be pitched at a minimum of four (4) feet vertical in twelve (12) feet horizontal. Curved roof surfaces shall have a rise equal to fifteen (15) per cent of the span.

**433.3.3. Condensate.**—Provisions shall be made in the design of the roof structure for the removal of condensate from the inner surface of the roof structure. Such provisions may be either incorporated into the design of the supporting element or may be attached thereto, but in no case shall they be detrimental to the use of the enclosed area below.

**433.3.4. Plastic Panels.**—Plastic panels to be incorporated as a part of the construction of covered malls, walkways, and tunnels shall comply with the applicable requirements of article 20.

**433.3.5. Glass Panels.**—Size, shape and type of material used shall be subject to approval of the building official.

**433.3.6. Allowable Areas.**—When complying with the provisions of this code, covered malls constructed of transparent or translucent materials whose supporting elements are of type 1 construction may not be more than fifty thousand (50,000) square feet in area. For all other types of allowable construction, the basic allowable area for covered malls constructed of transparent or translucent materials shall be twice the value indicated in section 221.2 table 2-2 for occupancy group F-3. All areas regardless of construction shall be sprinkered in conformance with section 1213.1.5.

**433.4. Multiple Levels.**—Balconies and mezzanines in covered malls shall conform to the requirements of section 432.0.

**433.5. Allowable Areas.**—(For other than transparent or translucent roofs). When complying with the provisions of this code, covered malls of type 1 construction may not be more than one hundred and fifty thousand (150,000) square feet unless sprin-

klers are provided. For all other types of construction, the basic allowable area for covered malls shall be as indicated in section 221.2 table 2-2 for group F-3 occupancy. The area of covered malls may be tripled when the covered mall is provided with a complete automatic sprinkler system. Unlimited areas as provided in section 221.2 table 2-2 shall not apply. Refer to section 433.3.6 for allowable areas explicitly for transparent or translucent roofs.

#### **433.6. Exitways.**

**433.6.1. Covered Mall.**—One-half (1/2) of the required egress width for buildings connected by a covered mall shall lead to the outside by means other than through the mall. The covered mall connecting buildings shall have not less than two (2) independent exitways located as remotely as practicable from each other. These exitways shall have a total exit width equal to that required for the exitways from all buildings which are within one hundred (100) feet travel distance to the mall exitways. The maximum distance of travel to an exitway measured within the mall shall not exceed two hundred (200) feet. In order to provide free and unencumbered travel in the mall to the outside, each side of the mall floor area shall be provided with an unobstructed space, not less than twelve (12) feet in width; parallel to the building lines and extending to the exitway from the mall. This width shall be designed to carry the weight of fire trucks.

**433.6.2. Enclosed and Tunneled Walkways.**—Enclosed and tunneled walkways shall not be accepted as a required means of egress unless they comply with the provisions of this article. When the length of enclosed or tunneled walkways not meeting the provisions of this article for required exitways is more than one and one-half (1-1/2) times the maximum allowable distance of travel of the most restrictive occupancy being connected, one (1) or more exitways from the enclosed or tunneled walkway shall be provided. Such exitways shall be located as remotely from points of connection between the enclosed or tunneled walkway and the buildings as is practicable.

**433.7. Ventilation.**—Smoke and heat venting shall be provided for covered malls and enclosed walkways and tunneled walkways. Such venting systems shall be in accordance with reference standard RS4-22.

## **SECTION 434.0. RADIOACTIVE MATERIALS AND RADIATION-PRODUCING EQUIPMENT**

This section shall apply to the construction, alteration, and use of buildings or spaces for radioactive materials and radiation-producing equipment. In addition to the requirements of this section, occupancies involving radioactive materials and radiation-producing equipment shall also comply with applicable requirements of the Health Code of the City of Boston, and of title 10 of the code of federal regulations relating to atomic energy, and of reference standard RS4-20.

**434.1. Laboratories.**—All laboratories required to register under the requirements of the above codes shall comply with the following:

**434.1.1. Construction.**—All buildings in which such laboratories occur shall be of noncombustible group I construction.

**434.1.2. Floors.**—All floors shall comply with the fireresistance requirements for the class of construction, and provide the degree of radioactive resistance required by applicable city, state, and federal regulations. A finished material shall be applied to provide a continuous nonporous surface which may be readily removed.

**434.1.3. Interior Finish.**—All insulation of acoustical treatments and interior partitions shall be of noncombustible material. Walls and ceilings shall have nonporous finishes of class A rating.

**434.1.4. Sprinkler Protection.**—Automatic sprinkler protection complying with the construction provisions of article 12 shall be provided, and such protection shall be designed for the type of combustible materials wherever such material is used, and for the radioactive material that may be expected to melt, vaporize, or oxidize under fire conditions. Laboratory equipment susceptible to damage from water or other materials used in the sprinkler system may be shielded by hoods except when the equipment provided a source of combustion. Where sprinkler protection uses water, or small water-spray installations are used to fight small isolated fires, floors shall be provided with drainage so that water may be carried to retention tanks for later disposal as required when contamination of water is to be anticipated.

**434.1.5. Electrical Equipment.**—Artificial lighting and electric equipment shall comply with section 400.5.

**434.1.6. Ventilation.**—Exhaust air from areas in which radioactive materials are used or stored shall be exhausted to the outdoors in such manner as not to create a health hazard, and shall not be recirculated to other areas of the building. Air pressure in rooms in which radioactive materials are used or stored shall be maintained below the air pressure of adjoining rooms, so that there is no flow of radioactive gases or dusts into adjoining rooms.

- a. Ducts shall be of sheet steel not less than No. 16 manufacturers' standard gage or of other equivalent non-combustible material having a melting point above 1800°F. Exhaust ducts within the building, on the discharge side of the fan, shall be welded airtight. Exhaust ducts within the building, on the suction side of the fan shall have laps in the direction of air flow with smoke-tight joints, and shall be subjected to a smoke test in accordance with the requirements for chimneys in article 10. Access hatches with tight-closing covers shall be provided for cleaning and for fire-fighting in the exhaust system ducts.
- b. Fume hoods shall be exhausted to the outdoors. Controls for hood fans shall be interlocked so that contaminated air cannot be drawn into any space from a hood where the exhaust fan is not in operation.
- c. Fan equipment other than the impeller and impeller housing shall be located outside the exhaust stream.
- d. When the degree of contamination of the exhaust stream exceeds the concentration limits permitted by the health code, the duct system shall be equipped with devices to decontaminate the air to a safe level before discharging to the outdoor air.

**434.1.7. Plumbing.**—Drainage lines from sinks used for radioactive wastes shall be without traps, and shall lead to retention tanks as required in section 434.1.4.

**434.2. Radiation Machines.**—Radiation machines or particle accelerators, linear accelerators, cyclotrons, synchrotrons, betatrons shall be located only in buildings of noncombustible group I construction; however, this requirement shall not apply to conventional medical, dental, research, or industrial x-ray machines of less than 1,000,000 volt capacity.

**434.3. Storage.**—Radioactive materials shall be stored in sealed containers. When required by the building official to avoid too

concentrated an exposure within any one space, radioactive materials shall be stored in vaults designed in accordance with the radiation shielding or other requirements for the materials to be stored. When any materials are subject to melting, vaporization, or oxidation under fire conditions, the storage vaults shall be constructed of walls having a fireresistance rating of at least four (4) hours, and the vaults shall be equipped with automatic sprinklers complying with the construction requirements of article 12 and shall be vented through devices to decontaminate the air to a safe level. Doors opening into storage vaults shall meet shielding requirements and have a fire-protection rating of not less than three (3) hours. All bins, shelving, partitions, and pallets in storage vaults shall be of noncombustible materials. Other methods of storage permitted by the health department or the atomic energy commission, such as storage under water, may be used.

## List of Reference Standards

- RS 4**      ANSI PH22.31    1967  
Motion Picture Safety Film
- APHA                          1957  
Swimming Pools and other Public Bathing Places,  
Recommended Practice for Design, Equipment and  
Operation
- Mass-DPS    Form B-3    1947  
Tents Used as Public Halls, Miscellaneous Halls,  
and Mercantile or Other Establishments, Regulations  
Applicable to
- Mass-DPS    Form B-5    1967  
Construction, Alteration, Remodeling, and Recon-  
struction of Grandstands, Bleachers, Stadia or Arenas,  
and Race Track Crash Barriers, Regulations Governing
- Mass-DPS    Form C    1955  
Use of the Cinematograph and Similar Apparatus for  
the Exhibition of Motion Pictures-Laws, Rules and  
Regulations Governing the
- Mass-DPS    FPR 2    1963  
Dry-Cleaning and Dry-Dyeing, and the Keeping,  
Storage and Use of Cleaning and Dyeing Fluid in  
Connection Therewith.
- Mass-DPS    FPR 4    1968  
Construction and Maintenance of Buildings or Other  
Structures Used as Garages and the Related Storage,  
Keeping and Use of Gasoline.
- Mass-DPS    FPR 5    1962  
Construction, Location, Installation and Operation of  
Liquefied Petroleum Gas Systems, Gas Piping and  
Appliance Installations in Buildings.

Mass-DPS FPR 6 1948  
Manufacturing and Handling of Plastics.

Mass-DPS FPR 13 1965  
Keeping, Storage, Manufacture or Sale in Limited  
Quantities of Flammable Fluids, Solids, or Gases.

NFPA Vol. 1 1969-70  
Flammable Liquids

NFPA 24 1969  
Outside Protection (Yard Piping)

NFPA 30 1969  
Flammable and Combustible Liquids Code

NFPA 32 1964  
Dry Cleaning Plants

NFPA 33 1969  
Spray Finishing Using Flammable and Combustible  
Materials

NFPA 34 1966  
Dip Tanks Containing Flammable or Combustible Li-  
quids

NFPA 40 1967  
Cellulose Nitrate Motion Picture Film

NFPA 42 1967  
Pyroxylin Plastic in Factories, Storage, Handling and  
Use

NFPA 43 1967  
Pyroxylin Plastic in Warehouses, Wholesale and Retail  
Stores

NFPA 58 1969  
Liquefied Petroleum Gases, Storage and Handling

NFPA 59 1968  
Liquefied Petroleum Gases at Utility Gas Plants



- NFPA 60 1961  
Pulverized Fuel Systems, Installation and Operation of
- NFPA 61A 1962  
Starch Factories, Prevention of Dust Explosions in
- NFPA 61B 1959  
Terminal Elevators, Prevention of Dust Explosions
- NFPA 61C 1962  
Flour and Feed Mills, Allied Grain Storage Elevators,  
Prevention of Dust Explosions
- NFPA 63 1964  
Industrial Plants, Fundamental Principles for Preven-  
tion of Dust Explosions in
- NFPA 64 1959  
Country Grain Elevators, Prevention of Dust Ignitions  
in
- NFPA 68 1954  
Explosion Venting Guide
- NFPA 88 1968  
Garages
- NFPA 90A 1969  
Air Conditioning and Ventilating Systems
- NFPA 102 1967  
Tents and Grandstands and Air-Supported Structures  
Used for Places of Assembly
- NFPA 204 1968  
Smoke and Heat Venting Guide
- NFPA 329 1965  
Underground Flammable and Combustible Liquid  
Tanks, Leakage From
- NFPA 501B 1968  
Mobile Homes

NFPA 654 1963  
Dust Explosion Prevention in Plastic Industry

NFPA 656 1959  
Spice Grinding Plants, Prevention of Dust Ignitions in

NFPA 657 1967  
Confectionery Manufacturing Plants, Prevention of  
Dust Explosions in

NFPA 701 1969  
Flame-Resistant Textiles and Films, Standard Method  
of Tests for

NFPA 801 1955  
Radioactive Materials, Safe Practice for Laboratories  
Handling of

NFPA 802 1960  
Nuclear Reactors, Fire Protection Practice for

US Federal Test Method Standard No. 191 1968  
Method 5190 Textile Test, Burning Rate of Cloth,  
30° Angle

**RS 4-1** NFPA 68 1954  
Explosion Venting Guide

**RS 4-2** NFPA 30 1969  
Flammable and Combustible Liquids Code

**RS 4-3** Mass. FPR 13 1965  
Keeping, Storage, Manufacture or Sale in Limited  
Quantities of Flammable Fluids, Solids, or Gases.  
NFPA 329 1965  
Underground Flammable and Combustible Liquid  
Tanks, Leakage From

**RS 4-4** Mass. FPR 5 1962  
Construction, Location, Installation and Operation of  
Liquefied Petroleum Gas Systems, Gas Piping and  
Appliance Installations in Buildings, Rules and Regu-  
lations Governing the

NFPA 58 1969  
Liquefied Petroleum Gases, Storage and Handling

NFPA 59 1968  
Liquified Petroleum Gases at Utility Gas Plants

**RS 4-5** Mass. FPR 6 1948  
Manufacturing and Handling of Plastics

NFPA 42 1967  
Pyroxylin Plastic in Factories, Storage, Handling and Use

NFPA 43 1967  
Pyroxylin Plastic in Warehouses, Wholesale and Retail Stores

NFPA 654 1963  
Plastics Industry, Dust Explosion Prevention

**RS 4-6** Mass. FPR 13 1965  
Keeping, Storage, Manufacture or Sale in Limited Quantities of Flammable Fluids, Solids or Gases.

**RS 4-7** NFPA 60 1961  
Pulverized Fuel Systems, Installation and Operation of

NFPA 61A 1962  
Starch Factories, Prevention of Dust Explosions in

NFPA 61B 1959  
Terminal Elevators, Prevention of Dust Explosions

NFPA 61C 1962  
Flour and Feed Mills, Allied Grain Storage Elevators, Prevention of Dust Explosions

NFPA 63 1964  
Industrial Plants, Fundamental Principles for Prevention of Dust Explosions in

NFPA 64 1959  
Country Grain Elevators, Prevention of Dust Ignitions in

NFPA 654 1963  
Plastics Industry, Dust Explosion Prevention

NFPA 656 1959  
Spice Grinding Plants, Prevention of Dust Ignitions in

NFPA 657 1967  
Confectionery Manufacturing Plants, Prevention of  
Dust Explosions in

**RS 4-8** NFPA 33 1969  
Spray Finishing Using Flammable and Combustible  
Materials

NFPA 34 1966  
Dip Tanks Containing Flammable or Combustible  
Liquids

**RS 4-9** Mass-DPS FPR 2 1963  
Dry-Cleaning and Dry-Dyeing, and the Keeping,  
Storage and Use of Cleaning and Dyeing Fluid in  
Connection Therewith.

NFPA 32 1964  
Dry Cleaning Plants

**RS 4-10** NFPA 24 1969  
Outside Protection (Yard Piping)

**RS 4-11** NFPA 102 1967  
Tents and Grandstands and Air-Supported Structures  
Used for Places of Assembly

Mass-DPS Form B-3 1947  
Tents Used as Public Halls, Miscellaneous Halls, and  
Mercantile or Other Establishments, Regulations Ap-  
plicable to

Mass-DPS Form B-5 1967  
Construction, Alteration, Remodeling, and Recon-  
struction of Grandstands, Bleachers, Stadia or Arenas,  
and Race Track Crash Barriers, Regulations Governing

- RS 4-12** Mass-DPS Form C 1955  
Use of the Cinematograph and Similar Apparatus for  
the Exhibition of Motion Pictures, Laws, Rules and  
Regulations Governing the
- RS 4-13** ANSI PH22.31 1967  
Motion Picture Safety Film
- NFPA 40 1967  
Cellulose Nitrate Motion Picture Film
- RS 4-14** NFPA 701 1969  
Flame-Resistant Textiles and Films, Methods of Tests  
for
- RS 4-15** US Federal Test Method Standard No. 191  
Method 5190 Textile Test, Burning Rate of Cloth,  
30° Angle
- RS 4-16** deleted
- RS 4-17** deleted
- RS 4-18** deleted
- RS 4-19** APHA 1957  
Swimming Pools and Other Public Bathing Places,  
Recommended Practice for Design, Equipment and  
Operation
- RS 4-20** NFPA 801 1955  
Radioactive Materials, Safe Practice for Laboratories  
Handling
- NFPA 802 1960  
Nuclear Reactors, Fire Protection Practice for
- RS 4-21** Mass FPR 4 1968  
Construction and Maintenance of Buildings or Other  
Structures Used as Garages and the Related Storage,  
Keeping and Use of Gasoline.

- NFPA 88 1968  
Garages
- RS 4-22** NFPA 204 1968  
Smoke and Heat Venting Guide
- RS 4-23** NFPA 90A 1969  
Air Conditioning and Ventilating Systems
- RS 4-24** NFPA Vol. 1 1969-70  
Flammable Liquids

## LIGHT, HEAT, VENTILATION AND NOISE CONTROL

<p>500.0 Scope</p> <p>501.0 Definitions</p> <p>502.0 Plans and Specifications</p> <p>503.0 Standards of Natural Light</p> <p>504.0 Standards of Natural Ventilation</p> <p>505.0 Standards of Heating</p> <p>506.0 Existing Buildings</p> <p>507.0 Standards of Artificial Light</p> <p>508.0 Standards of Mechanical Ventilation</p> <p>509.0 Ventilation of Special Spaces</p> <p>510.0 Omitted</p> <p>511.0 Omitted</p> <p>512.0 Institutional Buildings</p> <p>513.0 Omitted</p> <p>514.0 Omitted</p>	<p>515.0 Omitted</p> <p>516.0 Ventilation of Shafts other than Elevator and Dumb-waiter Hoistways and Stairways</p> <p>517.0 Omitted</p> <p>518.0 Courts</p> <p>519.0 Omitted</p> <p>520.0 Obstruction of Courts</p> <p>521.0 Fire Emergency Exhaust System</p> <p>522.0 Omitted</p> <p>523.0 Window Cleaning Safeguards</p> <p>524.0 Noise Control in Multiple Dwellings</p> <p>RS 5 Reference Standards</p>
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### TABLES

5-1 505.1.1. Minimum Space Temperature Requirements

### FIGURE

5-1 508.2.1. Minimum Outside Air Requirements for Ventilation and Air Conditioning

### SECTION 500.0. SCOPE

The provisions of this article shall establish and control the minimum requirements for light, heat, ventilation, and noise control except as otherwise provided in articles 4 and 6.

**500.1. Standards.**—The provisions of reference standard RS 5 are a part of this article.

**500.2. Tests and Inspections.**—All equipment and systems shall be tested and/or inspected to disclose defects or operating conditions dangerous to life or health. Such equipment or systems shall not be operated until defects or dangerous conditions are corrected.

### SECTION 501.0. DEFINITIONS

For definitions to be used in the interpretation of this article 2.

## **SECTION 502.0. PLANS AND SPECIFICATIONS**

Plans for all buildings and structures other than one- and two-family and multi-family dwellings, which are designed for human occupancy, shall designate the number of occupants to be accommodated in the various rooms and spaces. When means of artificial lighting and ventilation are required, the application shall include details and description of the mechanical system to be installed as herein required or as specified in article 18.

## **SECTION 503.0. STANDARDS OF NATURAL LIGHT**

**503.1. Natural Light Requirements.**—Provide every habitable room with natural light complying with the provisions of this article.

**503.2. Natural Light Sources and Locations.**—Natural light, when required, shall be admitted by windows, skylights, monitors, glazed doors, transoms, fixed lights, жалousies, or other natural-light transmitting media. Such sources shall face or open upon the sky, or upon a public street, space, alley, park, highway, or right of way, or upon a yard, court, plaza, or space above a setback, when such yard, court, plaza, or space above a setback is located upon the same lot and is of the dimensions required by the applicable provisions of the zoning resolution.

**503.3. Area of Natural Light Sources.**—The transmitting area of all sources of natural light not closer than thirty (30) inches to the finished floor shall aggregate at least ten (10) percent of the floor area of the space served.

## **SECTION 504.0. STANDARDS OF NATURAL VENTILATION**

**504.1. Occupiable Rooms.**—Ventilation of occupiable rooms shall be by natural or mechanical means, or both, except where mechanical ventilation is required by Sections 508.0. or 509.0.

**504.2. Habitable Rooms.**—All habitable rooms shall have natural ventilation.



**504.3. Alcoves.**—An alcove or room opening off another room or space shall be ventilated as a separate room, unless the opening between the alcove and the room or space is at least eighty (80) percent of the area of the common wall, and the floor area of the alcove does not exceed twice the area of the opening.

**504.4. Balconies.**—The area of an interior balcony or mezzanine which opens to form part of another room or space shall be added to the area of the room or space in which it is located to compute the ventilation required for both spaces.

**504.5. Natural Ventilation Openings.**—Natural ventilation shall be from unobstructed windows, skylights, monitors, doors, louvers, jalousies, or other similar openings. Such openings shall be direct to the sky, public street, space, alley, park, highway, or right of way; or upon a yard, court, plaza, or space above a setback, where such yard, court, plaza, or space above a setback is located on the same lot and is of the characteristics required by the applicable provisions of the zoning code and section 518.

**504.6. Area of Natural Ventilating Openings.**—Natural ventilating openings from habitable spaces shall have a free area when open of at least five (5) percent of the floor area of the space ventilated. In occupiable spaces, the free openable area shall be the basis to determine the minimum requirements for supplementary mechanical ventilation. Free openable area is the cross sectional area at plane of greatest restriction to air flow, exclusive of insect screening.

## **SECTION 505.0. STANDARDS OF HEATING**

**505.1. Heating Requirements.**—All habitable or occupiable spaces, and spaces listed in table 5-1 shall be heated in accordance with the requirements of this article and reference standard RS 5-1. Heating systems shall be capable of producing the temperature listed in table 5-1 when outdoor temperature is plus five (5) degrees F., and wind velocity is fifteen (15) miles per hour, plus due allowance for stack effect in tall buildings. Heating equipment shall not be required when either of the following conditions exist:

- a. Where occupancy is seasonal, the space contains no undrained water pipes, and the rooms or buildings will not be occupied between November 1 and May 1 of the following year.
- b. Where the processes or activities normally conducted within the space will generate sufficient heat to produce the prescribed indoor temperature during the time of occupancy.

**505.1.1. Table 5-1 Minimum Space Temperature Requirements\***

Rooms or Spaces	Minimum Temperature (degree F.)
Habitable rooms in all buildings	63 70
Building equipment and machinery rooms	50
Patients' rooms, bathrooms and toilet rooms, stairs and corridors in hospitals and nursing homes.	75
Bathrooms and toilet rooms, except patients' bathrooms and toilet rooms in hospitals and nursing homes.	70
Offices, waiting rooms, art galleries, museums, libraries, meeting rooms, churches, classrooms, auditoriums, lecture halls, night clubs, restaurants, theatres, nursery rooms, and spaces where persons are engaged in sedentary activities	70
Laboratories, light machine work, product inspections, loft buildings, shops, stores, display rooms, show rooms, sales rooms, and spaces where persons are engaged in moderate physical activities.	65
Gymnasias, dance halls, skating rinks, bowling alleys, heavy assembly workrooms or shops, and spaces where persons are engaged in vigorous physical activities.	60
Automotive repair shops	50
Storage areas, garages, space where work or process requires a low temperature	None
Hospital operating rooms, and recovery, labor, and delivery rooms	80
Swimming pools, bath houses, and shower rooms	75

**NOTE:** \*Where the listed temperatures differ from those that are required to be maintained under the provisions of rules, regulations, or laws of the state or city, the higher temperature shall apply.

**505.2. Minimum Temperature Requirements.**—Where the occupancy of any space does not conform exactly with one of the listed spaces, the temperature shall be determined by the requirements of the listed space to which it most nearly conforms.

**505.3. Devices Producing Incidental Heat.**—Devices within a space such as motors, generators, resistors, lights, compressors, steam-heated vessels, etc. which are in constant use during the period of occupancy and which produce heat may be considered as a supplementary heating device. Their heating capacity may be deducted from the required capacity of the heating devices in the room in the following percentage:

- |    |   |             |
|----|---|-------------|
| a. | If the equipment heat is liberated within seventy two (72) inches of the floor  | 100 percent |
| b. | If the equipment heat is liberated above seventy two (72) inches from the floor | 60 percent  |
| c. | If the equipment heat is liberated within an exhaust hood                       | 30 percent  |

**505.4. Capacity of Heat Sources.**—Heat sources shall have a gross output capacity sufficient to provide for the required heating load, including, if applicable, appropriate allowance for process loads, uncontrolled distribution losses, the heating of domestic hot water and temperature recovery (so-called pick-up) after night set-back.

## **SECTION 506.0 EXISTING BUILDINGS**

**506.1. Unsafe Conditions.**—If any existing space does not meet the requirements of this article for light and ventilation and, in the opinion of the building official, is dangerous to the health and safety of the occupants, upon his written order the repairs or installations required to conform to this article shall be made.

**506.2. Alterations.**—No building, or part thereof, shall hereafter be altered or rearranged so as to reduce any of the space conditions to less than the required standards prescribed in this article. No additional room shall be created unless made to conform to the requirements of this article.

**506.3. Noise Control.**—In multi-family dwellings, the installation of new mechanical equipment shall conform to the requirements of Section 524.0. Repairs to existing equipment is not considered as new equipment.

## **SECTION 507.0. STANDARDS OF ARTIFICIAL LIGHT**

**507.1. Artificial Light Requirements.**—Adequate means for producing artificial light shall be provided in every occupiable space in every building hereafter erected and in the portions of existing buildings where alterations are performed, except as follows:

- a. Artificial light is not required in rooms or spaces normally occupied exclusively during the daylight hours between one hour after sunrise and one hour before sunset and which have natural light sources as required by Sections 503.2. and 503.3.
- b. Artificial light is not required in rooms or spaces with less than forty (40) sq. ft. floor area if they are not regularly occupied and if they contain no heat producing equipment, no hazardous equipment or automatic safety devices.

**507.2. Means of Egress.**—Provide artificial illumination of means of egress as required in article 6.

**507.3. Places of Assembly.**—Provide artificial illumination of places of assembly as required in articles 4 and 6.

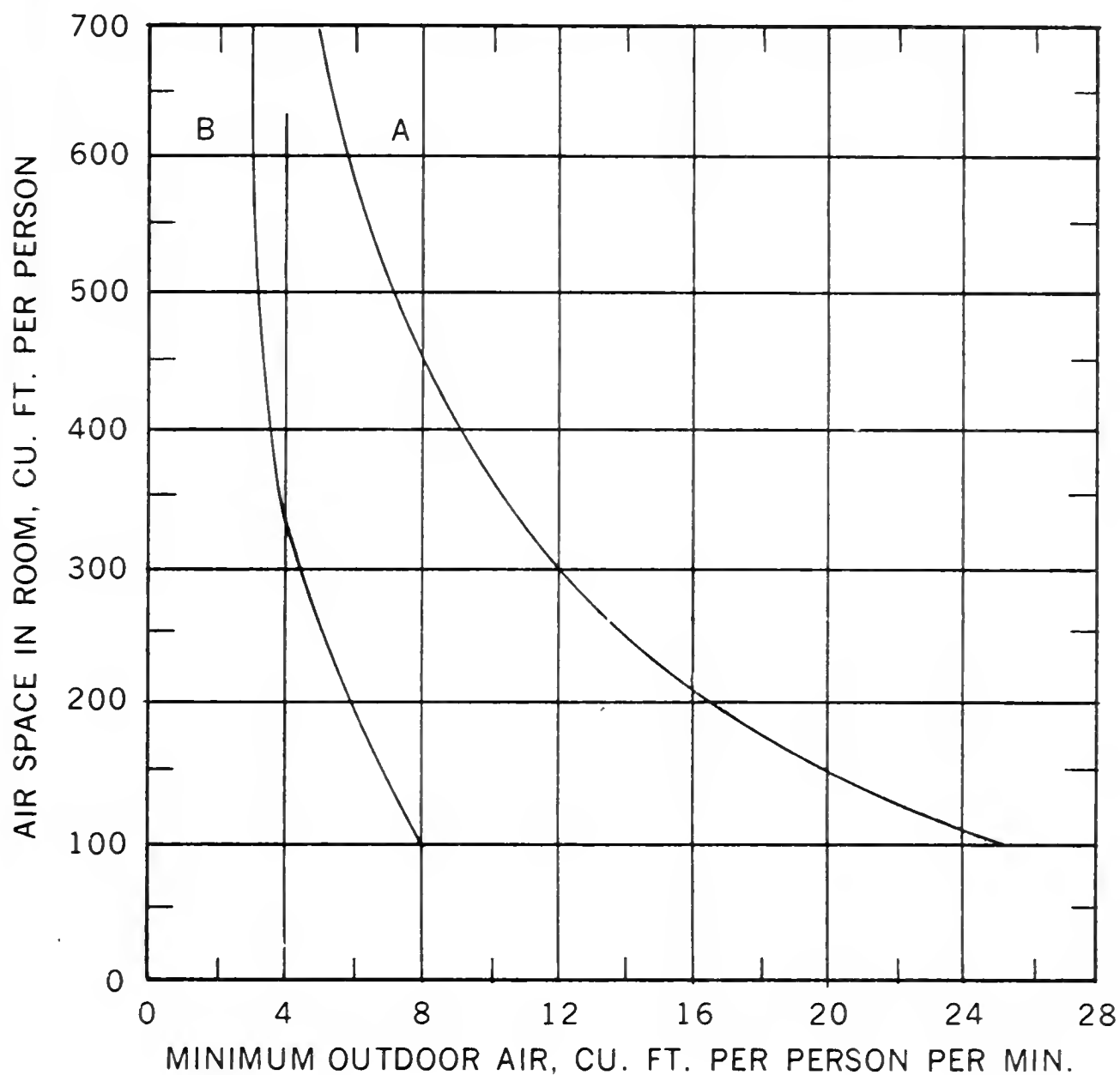
**507.4. Bathrooms and Toilet Rooms.**—Provide artificial illumination of bathrooms and toilet rooms averaging not less than ten (10) foot candles, thirty (30) inches above the floor.

## **SECTION 508.0. STANDARDS OF MECHANICAL VENTILATION**

**508.1. Areas Requiring Mechanical Ventilation.**—Mechanical ventilation shall be provided in all occupiable rooms or spaces where the requirements for natural ventilation are not met; in all rooms or spaces, which because of the nature of their use or occupancy, involve the presence of dust, fumes, gases, vapors, or other noxious or injurious impurities, or substances which create a fire hazard; or where required by the provisions of Section 509.0. or articles 4 and 6.

**508.2. Outside Air.**—Where mechanical ventilation is required the minimum amount of outside air introduced into any room or enclosed space shall be at least equal to the amount required by Figure 5-1.

**508.2.1. Figure 5-1 Minimum Outside Air Requirements for Ventilation and Air Conditioning**



**508.2.2. Curve A - Ventilation Only.**—The values obtained from Curve A represent the minimum volume of outdoor air required for adults quietly occupied. Where the space has mechanical cooling, the values of Curve A represent the minimum amount of air to be circulated.

- a. Values of Curve A shall be increased by twenty-five (25) percent for areas in which the occupancies contain or involve:
  1. Grade school children
  2. Light smoking
  3. Food Service
  4. Other occupancies involving light air contamination
- b. Values of Curve A shall be increased fifty (50) percent for areas in which the occupancies contain or involve:
  1. Manual labor
  2. Sports
  3. Dancing
  4. Heavy smoking
  5. Other occupancies involving heavy air contamination
- c. Values of Curve A shall be increased by an appropriate amount to remove excess heat or moisture generated by equipment in the occupied area.

**508.2.3. Curve B - Mechanical Cooling.**—The values obtained from Curve B represent the minimum volume of outdoor air required for adults quietly occupied where adequate control is maintained over temperature and humidity and where odor removal apparatus is used if smoking is permitted in the occupied area.

- a. Where only part of the above-mentioned controls are maintained, the values of Curve B must be increased in accordance with good engineering design and subject to the approval of the building official.

**508.3. Means of exhaust.**—Exhaust may be accomplished by:

- a. Forcing leakage through openings communicating directly to the outdoor air.
- b. By drawing the vitiated air from spaces into the return air duct of the system apparatus. When exhaust is to a return air duct the system apparatus shall be equipped to mix outdoor and return air under conditions which assures that the minimum amount of outdoor air will

never be less than the sum of the minimum outdoor air ventilation requirements of all the spaces served by that system.

- c. By drawing air into a fan powered exhaust system discharging directly to the outdoor air.

**508.4. Make-up Air.**—Sufficient air to replace the exhaust quantity shall be admitted to spaces which are under forcible exhaust by one or by any combination of the following methods:

- a. If permitted by this Code, by infiltration through louvres, registers, or other permanent openings in walls, doors, or partitions of adjoining spaces where air is supplied in sufficient excess to meet the requirements of both spaces.
- b. By infiltration through natural ventilation openings when the heating system is properly designed to permit such infiltration without causing drafts objectionable to the occupants.
- c. By other methods acceptable to the building official, and in conformance with good engineering practice.
- d. If permitted by this Code, exhaust may be accomplished by forcing leakage through permanent openings to adjoining spaces from which air is removed by method 508.3.c. provided the total amount of ventilation of both spaces is not reduced to less than the amounts required by Figure 5-1 and provided the space is not of the type from which recirculation of air is prohibited.

**508.5. Prohibited Use of Recirculated Air.**—Air drawn from the following spaces may not be recirculated: mortuary rooms, hospital operating rooms, bathrooms, water closet compartments, locker rooms, toilet rooms, rooms that must be isolated to prevent the spread of infection, or any space where flammable vapors, dust, odors, or noxious gases are present in amounts exceeding the Threshold Limit Values established for same by reference standard RS 5-2.

**508.6. Use of Adsorption Devices.**—If recirculation of air is permitted, the required outdoor air supply may be reduced up to fifty (50) percent, provided that an equivalent quantity of the recirculated air is passed through approved adsorption devices. The adsorption material, the material quantity and the means provided for maintaining the effectiveness of the adsorption devices shall be acceptable to the building official and in conformance with good engineering practice.

**508.6.1. Improper Maintenance.**—Should adsorption devices be improperly maintained in the opinion of the building official, he may order their removal. If the adsorption devices are removed the ventilating system shall not be operated unless it will supply one hundred (100) percent of the outdoor air required by this section or section 509.0.

**508.6.2. Test Records.**—The building owner shall continuously maintain a record showing the manufacturer's recommendation for frequency of tests, the method of making tests, and the results of periodic tests of the adsorption devices. Such tests shall be made and certified by the manufacturer or by a laboratory acceptable to the building official at least twice every six (6) months. The records of such tests shall be maintained for a period of at least two (2) years, and shall be available for inspection by the building official.

**508.7. Installation of Ventilating Systems.**—Where mechanical ventilation is installed as an alternate or supplement to natural ventilation, or is required under the conditions herein prescribed, the system, equipment, and distributing ducts shall be installed in accordance with the applicable provisions of articles 10, 11 and 18.

## **SECTION 509.0 VENTILATION OF SPECIAL SPACES**

**509.1. Kitchens.**—Kitchens shall be ventilated as follows:

**509.1.1. Dwelling Units.**—Kitchens located within dwelling units and having a floor area of greater than seventy (70) square feet shall have natural ventilation as prescribed in section 504.0. When the floor area is seventy (70) square feet or less, the kitchen shall be ventilated by either of the following:

- a. Natural means complying with section 504.0.
- b. Mechanical means exhausting at least two (2) cfm of air per square foot of floor area.

**509.1.2. Other than Dwelling Units.**—Kitchens, except those located within dwelling units, and any spaces where cooking of any kind is done, shall be ventilated by either of the following:

- a. Natural means complying with section 504.0. or mechanically air cooled means complying with Figure 5-1 section 508.2 and supplemented with auxiliary mechanical supply and exhaust ventilation adequate to remove the fumes and smoke from the cooking equipment when operating, in accordance with the provisions of article 18.



- b. Non-air cooled mechanical means exhausting at least three (3) cfm of air per square foot of floor area, but in no case less than one hundred fifty (150) cfm.

**509.1.3. Warming Area.**—Kitchens, snack bars, or pantries, where the operation consists of heating or warming previously prepared food that was cooked elsewhere, or where food is prepared in vending machines, may be ventilated by either or a combination of the following:

- a. Natural ventilation complying with section 504.0.
- b. Mechanical ventilation complying with section 508.0.

**509.1.4. Means of Exhaust.**—Air shall be exhausted through ducts or chimneys constructed in accordance with the provisions of articles 10, 11 and 18.

**509.1.5. Make-up Air.**—Make-up air shall be provided by one of the methods described in section 508.4.

**509.2. Bathrooms and Toilet Rooms.**—Bathrooms and toilet rooms shall be ventilated as follows:

**509.2.1. Natural Ventilation.**—When ventilated by natural means, the natural ventilation openings shall comply with sections 504.5. and 504.6. except:

- a. In no case shall the net free area of the ventilation openings be less than one and one-half (1-1/2) square feet.
- b. In occupancy groups H-1 and H-2, the ventilation opening may be to a vent shaft provided that the net free area of the opening is not less than three (3) square feet. The vent shaft cross-sectional area shall be equal to the sum of the required minimum ventilation openings plus one-fifth (1/5) square foot for every foot of height but not less than nine (9) square feet and open to the outer air at the top; or, the vent shaft may be open at the sides above the roof with louvres providing net free area equal to the area of the shaft.

**509.2.2. Natural Ventilation by Shaft or Duct.**—Ventilation may be by individual vent shafts or ducts constructed of non-combustible materials with a minimum cross-sectional area of one (1) square foot plus one-third (1/3) square foot for each additional water closet or urinal above two (2) in number. The upper termination of such ducts shall be equipped with a wind actuated ventilator cap with throat area equal to the duct area.

**509.2.3. Mechanical Ventilation.**—When a bathroom or toilet room is not ventilated by natural ventilation as required by this section, it shall be mechanically ventilated as follows:

- a. Rooms containing only one water closet or urinal shall be mechanically ventilated by an exhaust system capable of exhausting at least fifty (50) cfm.
- b. Rooms containing more than one water closet or urinal, and any auxiliary spaces such as those used in hand basins, slop sinks, and locker rooms, shall be mechanically ventilated by an independent exhaust system capable of exhausting at least forty (40) cubic feet of air per minute per water closet or urinal. The outdoor air supply shall conform to the requirements of section 508.0.
- c. Toilet exhaust systems shall be arranged to expel air directly to the outdoors.

**509.2.4. Make-up Air.**—Make-up air shall be provided by one of the methods described in section 508.4.

**509.3. Inside Locker Rooms.**—Inside locker rooms and dressing rooms for more than one (1) person shall be ventilated at a rate of four (4) changes of air per hour or as required by section 508.3., whichever is greater.

**509.4. Corridors.**—Corridors shall have ventilation provisions to supply outdoor air in conformance to whichever of the following is greater:

- a. For make-up of air exhausted to adjoining spaces. Provisions for make-up air supply shall conform to section 508.4.
- b. Natural sources complying with section 504.5. to provide ventilating openings equivalent to at least two and one-half (2-1/2) percent of the floor area.
- c. In occupancy groups H-1, H-2 and L-2 mechanical supply of at least one-half (1/2) cubic foot of outdoor air per minute per square foot of floor area.

**509.5. Crawl Spaces.**

**509.5.1. Buildings and Structures Without Basements.**—In buildings and structures constructed without basements, and in which the first floor construction does not bear directly on the ground, a space at least eighteen (18) inches high shall be provided directly under the floor beams, girders or still of the first floor construction. Where the floor above such a space is constructed of wood or metal, the space shall be ventilated by one of the following means:

- a. At least four widely separated ventilating openings, providing a total net free area of at least one-eighth hundredth ( $1/800$ ) of the area of the crawl space, shall be provided in the foundation walls, and the ground within the crawl space shall be covered with a vapor barrier in durability equivalent to at least fifty-five (55) pound roofing felt with unsealed laps and with a transmission rate of one (1) perm or less.
- b. At least two (2) ventilating openings, providing a total net free area of at least one-fifteen hundredth ( $1/1500$ ) the area of the crawl space shall be provided in foundation walls, provided that a vapor barrier with a transmission rate of one (1) perm or less is installed over the entire underside of the first floor construction and overlaps the walls.

**509.5.2. Buildings and Structures With Basements.**—No foundation wall vents shall be required where one side of a crawl space is completely open, except for structural members, to a basement that has an area at least equivalent to that of the crawl space, provided that the basement is naturally ventilated by openings complying with Sections 504.5. and 504.6.

**509.6. Ventilation of Boiler Rooms.**—Boiler rooms shall be ventilated in a manner that will provide air for combustion in accordance with the provisions of articles 10 and 11.

**509.7. Ventilation of Spaces With Excessive Temperatures, Strong Odors, Hazardous Concentrations of Toxic Substances, or Airborne Irritants.**—Each such space shall be ventilated by a system designed and installed to prevent any of the following conditions:

- a. Excessive temperatures that may be detrimental to the occupants.
- b. Concentrations of substances in the air in amounts exceeding the Threshold Limit Values established for same by reference standard RS 5-2.
- c. The danger of concentrations of any other airborne irritants and impurities, such as steam, gases, vapor, and dust, that may be injurious to health.

Where the exhausted air may contain toxic substances or strong objectionable odors, the exhaust system shall be independent of exhaust systems serving other parts of the building.

**509.8. Ventilation for Special Uses and Occupancies.**—Special uses and occupancies shall be ventilated in accordance with

the requirements of articles 4 and 6. Ventilation of stage areas shall be in accordance with the requirements of article 4.

## **SECTION 510.0 OMITTED**

## **SECTION 511.0 OMITTED**

## **SECTION 512.0 INSTITUTIONAL BUILDINGS**

Spaces in buildings of the institutional occupancy group shall be lighted and ventilated as herein required except that in buildings used for enforced detention of people (occupancy group H-1) openings to the street or court may be indirectly through intermediate corridors or other approved means.

## **SECTIONS 513.0.-515.0. OMITTED.**

## **SECTION 516.0. VENTILATION OF SHAFTS OTHER THAN ELEVATOR AND DUMBWAITER HOISTWAYS AND STAIRWAYS.**

All enclosed vertical shafts extending through more than two (2) stories of every building or structure, except elevator or dumbwaiter hoistways, and stairways, shall be automatically vented to the outer air as herein required or as specified in section 911.

**516.1. Extending to Roof.**—Shaft enclosures extending to the roof shall be provided with a metal skylight constructed to comply with section 928.2. or with windows of equivalent area or with approved automatic means of removing hot air and gases.

**516.2. Thermostatic Control.**—The operation of fire shutters, skylights and other vent relief devices may be controlled by fusible links designed to operate at a fixed temperature of not more than one hundred and sixty (160) degrees F., or by electric or pneumatic operation under a rapid rise in temperature at a rate of fifteen (15) to twenty (20) degrees F. per minute or by other approved methods.

**516.3. Not Extending to Roof.**—Shaft enclosures not extending to the roof shall have means of gas and smoke relief or adequate mechanical ventilation conforming to section 911.1. and article 18.

## **SECTION 517.0. OMITTED**

## **SECTION 518.0. COURTS**

All courts required to serve for light and ventilation purposes shall comply with requirements of this section.

### **518.1. Width of Court.**

**518.1.1. Minimum Width.**—Every such court shall have a minimum width of three (3) inches for each foot of height or fraction thereof but not less than five (5) feet for outer courts and twice these values for inner courts as defined in 518.4.1.

**518.1.2. Irregular Court Width.**—In the case of irregular or gore-shaped courts, the required minimum width of court may be deemed to be the average width, provided that no such court shall be less than five (5) feet at any point.

**518.2. Area of Court.**—The cross-sectional area of a required court shall be not less than one and one-half (1-1/2) times the square of its required minimum width; nor shall the length of any court be more than twice its required minimum width.

**518.3. Access to Court.**—A door or other means of access shall be provided at the bottom of every court for purposes of cleaning.

### **518.4. Air Passages to Court.**

**518.4.1. Inner Court.**—Every court serving one or more habitable rooms that does not open for its full height on one or more sides to a street or legal yard shall be connected at or near the bottom with a street or yard by a horizontal passage of fire-resistive construction. Such passage shall have a cross-sectional area of not less than twenty-one (21) square feet, and shall remain fully open at both ends and unobstructed for its full size and length, except that grilles of noncombustible construction complying with the approved rules may be permitted at the ends of the passage.

**518.4.2. Fire-resistance.**—The walls, floors and ceilings of such passages shall have a fire-resistance rating conforming to section 220.1., Table 2-1, but not less than two (2) hours in buildings of types 1, 2 or 3 construction and not less than three-quarter (3/4) hour in type 4 construction.

**518.5. Court Walls.**—When in the opinion of the building official, windows facing on courts do not receive adequate direct light by reason of peculiar arrangement or orientation, he may require the walls to be constructed of light colored masonry, or to be painted and maintained a light color to furnish additional reflected light.

**518.6. Court Drainage.**—The bottom of every court shall be graded and drained to a public sewer or other approved disposal system complying with the Massachusetts Plumbing Code; and shall be paved with concrete or other non-absorbent material when required by the building official.

## **SECTION 519.0. OMITTED**

## **SECTION 520.0. OBSTRUCTION OF COURTS**

**520.1. Permissible Projections.**—Every required court shall remain unobstructed for its required area and full height, except for the projections permitted in section 313. In residential and institutional buildings, clothes poles, arbors, garden trellises and other such accessories shall not be prohibited in the open spaces at ground level.

**520.2. Motor Vehicle Parking.**—When approved by the building official, required court areas may be used for automobile parking spaces or private garages not exceeding one (1) story in height when accessory to and only for the use of the occupants of a residential building, provided required windows for light and ventilation are not obstructed thereby.

## **SECTION 521.0. FIRE EMERGENCY EXHAUST SYSTEM.**

In all buildings and structures herein required to have fire emergency exhaust systems, the exitways shall be constructed with:

- a. Vertical fire vent stacks and lateral fire vent ducts as herein provided, or
- b. Windows to the outer air, or
- c. Mechanical exhaust systems, or
- d. Other equivalent approved means for dissipating smoke, heated air and toxic gases directly to the outer air in the event of fire.

**521.1. Where Required.**—Fire emergency exhaust systems shall be provided:

- a. In buildings used for H-1 and H-2 (institutional) occupancy and for L-1 and L-2 (hotel and apartment house) occupancy groups which:
  1. Exceed three (3) stories or forty (40) feet in height, and
  2. Exceed ten thousand (10,000) square feet in floor area, and
  3. Are occupied by more than fifty (50) persons above the first floor, or have more than twenty-five (25) sleeping rooms above the first floor.
- b. In all fully enclosed industrial buildings without exterior window openings for ventilation purposes.

**521.2. Fire Vent Ducts.**—Exitways which are not ventilated by windows opening directly to the outer air shall have a system of collecting fire ducts in each story to remove the smoke and gases in event of fire. Fire vent ducts shall connect to screened openings of not less than one (1) square foot in area located in each exitway and complying with sections 1009 and 1119. Ducts shall have cross-sectional area equal to the sum of the screened openings upstream of the section.

**521.3. Thermostatic Operation.**—When not connected to a vent stack, the inlet openings on each story shall be controlled by automatic opening heat-operated devices as required in section 516.2.

**521.4. Fire Vent Stacks.**—When the fire ducts do not discharge directly to the outer air in each story, one or more fire vent stacks of adequate capacity shall be installed to accommodate the discharge from the fire duct system in any enclosed fire area on one floor, but in no case shall any individual stack be less than four (4) square feet in area, and all stacks shall terminate in an approved wind-actuated ventilator outlet above the roof.

**521.5. Location of Stacks.**—The vent stack shall be located in as central a position as practicable with respect to the floor area vented thereby, preferably in the vicinity of vertical shafts, and shall extend continuously to the roof.

**521.6. Vent Control of Stacks.**—The vent control of the vertical stacks shall consist of approved noncombustible dampers, shutters, or glazed metal sash designed to open outwardly, located not less than twenty (20) feet distant from window

openings or exit doors in adjoining walls, and shall be equipped with a thermostatic unit arranged to open at a predetermined rate of temperature rise in accordance with the approved rules. Auxiliary mechanical means for manual operation of all vent controls shall be provided in an accessible location designated by the building official.

**521.7. Stack Construction.**—The stack enclosure shall be constructed to be vapor and smoke tight with walls of not less than two (2) hours fire-resistance, with no openings other than the fire duct inlets and the top outlet.

**521.8. Mechanical Exhaust Systems.**—When mechanical exhaust is required to operate the emergency system either in horizontal ducts or vertical vent stacks, the installation shall be thermostatically controlled and installed in accordance with the provisions of article 18 and the approved rules.

## **SECTION 522.0. OMITTED.**

## **SECTION 523.0. WINDOW CLEANING SAFEGUARDS.**

All buildings and structures over fifty (50) feet or four (4) stories in height, other than one- and two-family and multi-family dwellings (occupancy groups L-2 and L-3), in which the windows are cleaned from the outside shall be provided with anchors or other approved safety devices for all window openings. Such anchors, belt terminals or other devices shall be of approved design, constructed of corrosion-resistive materials securely attached to the window frames or anchored in the enclosure walls of the building. Cast iron or cast bronze anchors shall be prohibited.

Industrial Bulletin No. 21-Revised Rules and Regulations for the Prevention of Accidents in Window Cleaning, Massachusetts Department of Labor and Industry contains further mandatory requirements for window cleaning safeguards.

**523.1. Exterior Scaffolds.**—Window cleaning anchors may be eliminated on buildings which provide mechanically operated exterior scaffolds, or other approved methods for washing windows.

**523.2. Pivoted Windows.**—Buildings of occupancy group E (Business Buildings) over forty (40) feet or three (3) stories in height, in which the windows are designed to pivot for cleaning from the inside, shall be provided with a roof mounted, record-



ing type anemometer to determine the wind velocity; and no window shall be pivoted when the wind velocity exceeds fifteen (15) miles per hour.

## **SECTION 524.0. NOISE CONTROL IN MULTIPLE DWELLINGS**

**524.1. Requirements.**—Interior walls, partitions and floor-ceiling constructions in spaces or buildings of occupancy groups L-1 and L-2 shall be designed and constructed in accordance with the requirements of this section, to provide minimum protection for each dwelling unit from extraneous noises emanating from other dwelling units. In addition, airborne sound from exterior mechanical equipment of buildings in any occupancy group shall conform to the requirements of this section.

**524.2. Field Testing.**—Where conditions indicate that the installed construction or equipment does not meet the noise control prescribed in this section, measurements shall be taken to determine conformance or nonconformance. For conformance with this section, the results of such measurements shall not fail by more than two (2) decibels to meet the requirements in any octave band, or by more than two (2) points to meet any sound transmission class or impact noise rating requirements.

### **524.3. Acoustical Isolation of Dwelling Units.**

#### **524.3.1. Airborne Noise.**

- a. Walls, partitions, and floor-ceiling constructions separating dwelling units from each other or from public halls, corridors, or stairs shall have a minimum sound transmission class rating of forty-five (45) for airborne noise. The requirement shall not apply to dwelling unit entrance doors.
- b. Sound transmission class ratings shall be obtained by tests conducted in accordance with the procedures of reference standard RS 5-3, except as provided in (c.) below.
- c. The sound transmission class ratings of construction assemblies as listed in the applicable standards specified in reference standards RS 5-3, RS 5-4, and RS 5-5 may be used to determine conformance with the requirements of (a.) above and with any other section that requires a specific sound transmission class rating.

- d. Penetrations or openings in walls, partitions, or floors for pipe sleeves, medicine cabinets, hampers, electric devices, or similar items shall be packed, sealed, lined, backplastered, or otherwise isolated by sufficient mass to maintain the required sound transmission class ratings.
- e. Where grilles, registers, or diffusers in one (1) dwelling unit are connected by ductwork with grilles, registers, or diffusers in another dwelling unit, the duct shall be designed by means of length, offsets, sound absorbent lining, sound traps, or any combination thereof, to provide a minimum noise reduction of thirty (30) decibels in the third octave band relative to transmitted sound. Such ductwork systems shall not transmit self-generated noises, due to any attached part or component, which results in radiation of noise into any habitable space.

**524.3.2. Structure-Bourne Noise.**

- a. Floor-ceiling constructions separating dwelling units from each other or from public halls or corridors shall have a minimum impact noise rating of fifty (50).
- b. Such impact noise rating shall be obtained by tests conducted in accordance with the procedure of reference standard RS 5-4, except as provided in (c.) below.
- c. The impact noise rating of a floor-ceiling construction listed in the applicable standards specified in reference standards RS 5-3, RS 5-4, and RS 5-5 shall be used to determine conformance with the requirements of (a.) above and with any other paragraph that requires a specific impact noise rating. Constructions shall be designed and installed to avoid short circuiting the isolation devices that are incorporated into the constructions.

# RS 5

## REFERENCE STANDARD RS 5 LIGHT, HEAT, VENTILATION AND NOISE CONTROL

### List of Reference Standards

- RS 5      ACGIH                      1968  
Industrial Ventilation, A Manual of Recommended  
practice. Appendix—Threshold Limit Values.
- ASHRAE                      1967  
Guide and Data Book, Handbook of Fundamentals
- ASHRAE                      1968  
Guide and Data Book, Applications
- ASHRAE                      1969  
Guide and Data Book, Equipment
- ASTM E90                      1966  
Recommended Practice for Laboratory Measurement  
of Airborne Sound Transmission Loss of Building  
Floors and Walls
- IBI                              1967  
Noise Control with Insulation Board for Homes,  
Apartment, Motels, Offices. 4th edition.
- NCMA                              1955  
Sound Reduction Properties of Concrete Masonry  
Walls
- NCMA                              1959  
Sound Transmission Loss and Air Flow Resistance  
Measurements on Concrete Block Walls.
- US FHA                              1967  
Guide to Airborne, Impact, and Structure Bourne  
Noise Control in Multifamily Dwellings

- RS 5-1** ASHRAE 1967  
Guide and Data Book—Handbook of Fundamentals
- ASHRAE 1968  
Guide and Data Book—Applications
- ASHRAE 1969  
Guide and Data Book—Equipment
- RS 5-2** ACGIH 1968  
Industrial Ventilation, A Manual of Recommended Practice. Appendix—Threshold Limit Values.
- RS 5-3** ASTM E90 1966  
Recommended Practice for Laboratory Measurement of Airborne Sound Transmission Loss of Building Floors and Walls
- RS 5-4** US FHA 1967  
Guide to Airborne, Impact, and Structure Borne Noise Control in Multifamily Dwellings
- RS 5-5** IBI 1967  
Noise Control with Insulation Board for Homes, Apartments, Motels, Offices. 4th Edition.
- NCMA 1955  
Sound Reduction Properties of Concrete Masonry Walls
- NCMA 1959  
Sound Transmission Loss and Air Flow Resistance Measurements on Concrete Block Walls.

**MEANS OF EGRESS**

600.0	Scope	613.0	Grade Passageways and Lobbies as Exitway Elements
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604.0	Unlimited One Story Buildings	617.0	Exitway Ramps
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606.0	Existing Buildings	619.0	Access to Roof
607.0	Maintenance of Exitways	620.0	Smokeproof Towers
608.0	Occupancy Load	621.0	Exterior Exitway Stairways
609.0	Types and Location of Exitways	622.0	Moving Exitway Stairways
610.0	Capacity of Means of Egress Parts	623.0	Elevators in Exitways
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612.0	Exitway Access—Passage- ways, Corridors, and Balconies	625.0	Omitted
		626.0	Exitway Signs and Lights
		627.0	Means of Egress Lighting
		RS6	Reference Standards

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6-2	609.3.2	Maximum Allowable Exitway Access Travel Distance
6-3	610.2.1	Determination of Exitway and Access Requirements
6-4	614.1.1	Maximum Occupant Load—For Spaces With One Door

**SECTION 600.0. SCOPE**

The provisions of this article shall control the design, construction and arrangement of building elements required to insure safe means of egress from all buildings hereafter erected, and from all buildings hereafter altered to a new occupancy load, or occupancy group, or required for inherent fire safety of the occupants. Existing buildings and occupancies shall be controlled by the provisions of section 606.

**600.1. Modification of Means of Egress Requirements.**—When strict compliance with the provisions of this Code is not practical, the building official may accept alternate means of egress which will accomplish the same purpose, by the procedure established in article 1 for modification of this Code or by adoption of approved rules.

**600.2. Minimum Requirements.**—It shall be unlawful to alter any building or structure in any manner that will reduce the means of egress below the requirements of this Code for new buildings of the proposed use and occupancy.

**600.3. Other Standards.**—Compliance with the applicable provisions of reference standard RS 6 shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

## **SECTION 601.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.

## **SECTION 602.0. PLANS AND SPECIFICATIONS**

**602.1. Arrangement of Exitways.**—The plans shall show in sufficient detail the location, construction, size and character of all exitways together with the arrangement of aisles, corridors, passageways and hallways leading thereto and the exitway discharges therefrom all in compliance with the provisions of this Code.

**602.2. Number of Occupants.**—In other than one- and two-family dwellings, the plans and the application for permit shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces when required by the building official. When not otherwise specified, the minimum number of occupants to be accommodated by the means of egress facilities shall be determined by the occupancy load prescribed in section 608. The posted occupancy load of the building shall be limited to that number.

## **SECTION 603.0. OCCUPANCY REQUIREMENTS**

Every building and structure and part thereof hereafter erected shall have the prescribed number of exitways of one or more of the approved types defined in this article. Every exitway in combination with the exitway access thereto and exitway discharge therefrom shall provide a safe and continuous means of egress to a street or to an open space with direct access to a street.

**603.1. General Requirements.**—The occupancy group classification of the building, the number of occupants, the floor area,

the travel distance to an exitway and the capacity of the exitway shall be considered in determining the exitway requirements.

**603.2. Mixed Occupancy Groups.**—When a building is classified in more than one occupancy group in accordance with the provisions of article 2, the exitway requirements for the entire building shall be determined on the basis of the occupancy group having the strictest exitway requirements, or the exitway requirements for each building section shall be determined separately or when places of assembly, night clubs and rooms and spaces for similar occupancies are provided in a building section, the exitways shall be adequate for the combined occupancy tributary thereto.

**603.3. Incidental Occupancies.**—When a building contains incidental occupancies classified in occupancy groups other than that under which the building is classified, the exitway requirements for the floor on which such occupancies occur shall be based upon those of the occupancy group under which the building is classified; but the exitway access and exitway requirements for the incidental occupancy shall be based upon the occupancy group classification of the incidental occupancy.

**603.4. Multiple Occupancy.**—Where a building, floor, or space is used for multiple purposes involving different activities at different times, that occupancy involving the greatest number of occupants shall be used in determining the exitway requirements

**603.5. Multiple Tenants.**—When more than one (1) tenant occupies any one (1) floor of a building or structure, each tenant shall be provided with separate direct access to the required number of approved exitways without passing through premises occupied by other tenants, except as permitted for balconies in section 612.7.

**603.6. Building Access.**—All buildings classified in occupancy groups other than A, B-1 or B-2, open structures of D-2 or L-3, shall have at least one (1) primary entrance accessible to and usable by individuals in wheelchairs. Such entrance shall provide access to a level that makes elevators available in buildings where elevators are provided. Where ramps are used to comply with this requirement, they shall have a slope not greater than 1 in 10, and shall otherwise conform to the provisions of section 617.

## **SECTION 604.0. UNLIMITED ONE STORY BUILDINGS**

In one (1) story business, industrial and storage buildings of unlimited area when permitted under the provisions of section 309, sufficient exitways shall be provided to accommodate the entire occupancy load on each front of the building; and the unobstructed length of travel to a street exitway or to the entrance of an enclosed tunnel or other enclosed exitway leading to a street shall not exceed the maximum travel distances provided in section 609.3.2 table 6-2 except as may be specifically provided for in reference standard RS 6-1.

## **SECTION 605.0. AIR-CONDITIONED BUILDINGS**

**605.1. Location of Stairways.**—In all buildings, without exterior window openings in all stories, that are artificially ventilated and/or air conditioned as provided in section 517, the stairway element of required exitways shall be located as to be accessible to the fire department either through the access openings specified in section 861 or as otherwise approved in at least alternate stories of the building.

### **605.2. Exhaust Ducts.**

**605.2.1. Exitways.**—No exhaust ducts or vents of air-conditioning systems shall discharge into stairway enclosures.

**605.2.2. Exitway Access.**—Corridors serving as exitway access shall not be used as the return exhaust from air-conditioned spaces through louvres or other devices in the doors or partitions enclosing such air-conditioned spaces, unless such passageways are equipped with approved products of combustion detectors to automatically stop the supply and exhaust fans and close the louvres and unless such use is approved by the building official.

## **SECTION 606.0. EXISTING BUILDINGS**

**606.1. Owner Responsibility.**—The owner or lessee of every existing building and structure shall be responsible for the safety of all persons in or occupying such premises with respect to the adequacy of means of egress therefrom as required by this Code.

### **606.2. Unsafe Means of Egress.**



**606.2.1. Inadequate Exitways.**—In any existing building or structure, not now provided with exitway facilities as herein prescribed for new buildings and in which the exitways are deemed inadequate for safety by the building official, such additional provision shall be made for safe means of egress as he shall order.

**606.3. No Change in Use.**—When there is no change in occupancy group or occupancy load, the minimum exitway requirements shall be as follows:

**606.3.1. New Exitways.**—If new or altered exitway facilities are installed or constructed they shall comply with all the requirements for new buildings.

**606.3.2. Existing Exitways.**—In all buildings (other than one- and two-family dwellings), exceeding three (3) stories or forty (40) feet in height, or having more than seventy (70) occupants above or more than forty (40) occupants below the grade floor, all existing unenclosed stairways shall be enclosed with partitions and opening protectives of three-quarter (3/4) hour fireresistance rating complying with article 9; or such exitways may be protected with a partial sprinkler system operated on the house water supply when complying with article 12. Existing enclosures of substandard fireresistive construction shall be covered on the stair side only with the component materials required for a three-quarter (3/4) hour fireresistive assembly.

**606.3.3. Fire Escapes.**—In buildings not over five (5) stories or seventy (70) feet in height, fire escapes complying with the requirements of section 624 may be accepted as a secondary means of egress when deemed adequate by the building official and when approved access to the street is provided from the termination of the fire escape.

**606.4. Existing Occupancy Changed.**—In every building or structure in which there is a change from one occupancy group to another or when there is an increase in occupancy load, the exitway facilities serving the new use and occupancy shall be made to comply with all the provisions of this article for buildings hereafter erected.

## **SECTION 607.0. MAINTENANCE OF EXITWAYS**

**607.1. Obstructions.**—It shall be unlawful to obstruct, or reduce in any manner the clear width of any doorway, hallway, passageway, exitway access or any other portion of a means of egress required by the provisions of this Code.

**607.2. Exterior Exitways.**—Exterior stairways and fire escapes shall be kept clear of all flower boxes, pots and other obstructions; and no display sign or other obstruction shall be attached to the building as to interfere with free operation and use of such elements of a means of egress.

**607.3. Maintenance.**—All exterior stairways and fire escapes shall be kept free of snow and ice. They shall be properly painted before and after erection; and shall be scraped and painted as often as necessary to maintain them in safe condition and good repair.

## **SECTION 608.0. OCCUPANCY LOAD**

**608.1. Design Occupancy Load.**—In determining required exitway facilities, the number of occupants for whom exitway facilities shall be provided shall be established by the largest number computed as follows:

**608.1.1.** The actual number of occupants for whom each occupied space, floor, or building, as the case may be, is designed for, or,

**608.1.2.** The number of occupants computed at the rate of one occupant per unit of area as prescribed in section 608.1.4 table 6-1, or,

**608.1.3.** The number of occupants of any space as computed in 608.1.1 or 608.1.2 above plus the number of occupants similarly computed for all spaces that discharge through the space in order to gain access to an exitway.

## 608.1.4. Table 6-1. Occupancy Allowances

Occupancy Group	Net Floor Area per Occupant (square feet)
Billiard Rooms .....	50
Bowling Alleys .....	50 See section 608.1.4.a.
Classrooms .....	20
Courtrooms.....	40
Dance Floors.....	10
Dining Spaces (non-residential) .....	12
Exhibition Spaces .....	10
Garages and Open Parking Structures.....	250
Gymnasiums .....	15
Habitable rooms .....	140
Industrial Shops .....	200
In schools .....	50
Institutional Sleeping Rooms	
Adults .....	75
Children .....	50
Infants .....	25
Kindergarten .....	35
Kitchen (non-residential) .....	200
Laboratories.....	50
Preparation rooms .....	100
Locker rooms .....	12
Lodge rooms .....	15
Offices .....	100
Passenger Terminals or Platforms .....	See section 608.1.4.b.
Sales area (retail)	
First floor and basement .....	25
All other floors .....	50
Seating Areas (audience in all assembly occupancies)	
Fixed Seats .....	See section 608.1.4.c.
Moveable Seats .....	10
Skating Rinks .....	15
Stages .....	15 performing area 50 other areas
Standing room (audience in all assembly occupancies)	4
Storage rooms .....	200

- a. or if greater, the following: allow five (5) persons per alley, which shall include fifteen (15) feet of runway, plus one (1) person for each ten (10) square feet of space remaining,
- b. 1.5 times the capacity of all passenger vehicles that can be unloaded simultaneously,
- c. designed number of seats or occupants.

**608.2. Mezzanine Floors.**—The occupancy load of a mezzanine floor discharging through a floor below shall be added to the main floor occupancy and the capacity of the exitways shall be designed for the total occupancy load thus established.

**608.3. Roofs.**—Roof areas occupied as roof gardens or for assembly, storage or other purposes shall be provided with exitway facilities to accommodate the required occupancy load, but in no case shall there be less than two (2) approved means of egress for assembly uses from such roof areas.

**608.4. Special or Unlisted Occupancies.**—Where data regarding the square feet per person for an occupancy is not listed in section 608.1.4. table 6-1, the occupant load shall be established by the architect or engineer, subject to the approval of the building official.

**608.5. Conflict.**—When there are special requirements for specific occupancies and uses in article 4 which differ from general requirements herein prescribed, such special provisions shall take precedence.

**608.6. Non-Simultaneous Occupancy.**—The occupant load of toilets, locker rooms, meeting rooms, storage rooms, employee cafeterias, and similar rooms or spaces that are not occupied at the same time as other rooms or spaces on the same floor of a building, may be omitted from the occupant load calculation of the floor on which they are located, to the extent that such spaces only serve occupied rooms on the same floor.

**608.7. Modifications.**

**608.7.1.** When the actual occupant load of any space will be significantly lower than that listed in section 608.1.4 table 6-1, the building official may establish a lower basis for the determination of the occupant load.

**608.7.2.** When a building existing on the effective date of this Code is altered or changed in occupancy or use so as to require enlarged exitway facilities, the building official may authorize the alteration or change in occupancy or use without an enlargement of exitway facilities, provided the occupant load is limited to that accommodated by the existing exitway facilities as determined by the provisions of this Code, and the building or space is posted accordingly with a sign. Such signs shall be at least twelve (12) inches in width and sixteen (16) inches in height. The lettering shall be red on a white background. The letters shall be not less than one and one-quarter (1-1/4) inches high.

**SECTION 609.0. TYPES AND LOCATION OF EXITWAYS**

All approved means of egress and parts thereof, including doorways, passageways, corridors, hallways, interior stairways, exterior stairways, moving stairways, smoke-proof towers, ramps, horizontal exitways, bridges, balconies, fire escapes and combinations thereof shall be arranged and constructed as provided herein and in compliance with article 16 for moving stairways and article 9 for fire enclosure requirements.

**609.1. Arrangement.**—All exitways and access thereto and discharge therefrom shall be so located that they are clearly visible or their locations clearly indicated. They shall be kept readily accessible and unobstructed at all times. They shall be so arranged as to lead directly to the street or to an area of refuge with supplemental means of egress that will not be obstructed or impaired by fire, smoke or other cause.

**609.2. Remote Locations.**—Whenever more than one (1) means of egress is required from any room, space or floor of a building, they shall be placed as remote from each other as practicable, and shall be arranged to provide direct access in separate directions from any point in the area served. Door openings to scissor stairs shall be at least fifteen (15) feet distant from each other.

**609.3. Length of Travel.**

**609.3.1. General Requirement.**—Where not otherwise specifically required by other sections of this Code, the maximum travel distance of exitway access from the most remote point in any room or space to the center of a door opening directly on an open exterior space or to an exitway shall not be greater than the limit specified in section 609.3.2 table 6-2 for the occupancy group classification of the room or space, nor greater than the specific minimum travel distance requirements of article 4.

**609.3.2. Table 6-2. Maximum Allowable Exitway Access Travel Distance.**

Occupancy Group of Building or Space	Group Designation	Maximum Travel Distance (ft.)	
		Unsprin- kled	Sprin- kled
High Hazard	A	75	150
Storage	B-1	100	150
	B-2*	125	175
Mercantile	C	150	200
Industrial	D-1	125	175
	D-2	150	200
Business	E	200	300
Assembly	F	150	200
School	G	100	150
Institutional	H-1	125	175
	H-2	125	175
Residential**	L-1	150	200
	L-2	150	200
	L-3	N.R.	N.R.

N.R.—No Requirements

\*Except that all Public Garages shall be one hundred (100) feet if unsprinkled and one hundred and fifty (150) feet if sprinkled. See 611.5.2 for open parking structures.

\*\*Unless otherwise specified in sections 611.3.1, 613.3.2, or 621.1.1.

**609.3.3. Travel Distance Within Dwelling Units.**—In buildings classified in occupancy groups L-1 and L-2, the maximum travel distance from the centerline of a door from any habitable room within a dwelling unit either to the centerline of a door opening on a corridor providing access to the exitway or to a door

within the unit opening on an exitway shall not be greater than forty (40) feet. Such travel distance shall be included in the maximum travel distance established in section 609.3.2 table 6-2.

**609.3.4. Measurement.**—Travel distance shall be measured along a natural and unobstructed path of travel. Where the path of travel is over an access stair, it shall be measured along an inclined straight line through the center of the outer edge of each tread.

## **SECTION 610.0. CAPACITY OF MEANS OF EGRESS PARTS**

**610.1. Unit of Egress Width.**—Except as provided in sections 614 and 622, the unit of egress width for all approved types of means of egress parts and facilities specified in section 609 shall be twenty-two (22) inches with a credit of one-half ( $1/2$ ) unit for each twelve (12) inches clear width in addition to one (1) or more twenty-two inch units. Fractions of a unit of width less than twelve (12) inches shall not be credited.

**610.2. Design Capacity Allowance.**—Except as may be specifically modified in article 4, the design capacity of the means of egress shall be measured in units of egress width and the number of persons per unit of width shall be determined by the occupancy group classification and the means of egress part as listed in section 610.2.1 table 6-3. Where computations of total required width give fractional results, the next larger whole number of egress units or whole number plus one-half ( $1/2$ ) may be neglected in cases where such fractions constitute less than ten (10) percent of the total required number of units. Notwithstanding any of the above computations, no means of egress part or facility shall be narrower than the minimum width requirements specified in section 610.2.1 table 6-3 or elsewhere in this Code.

610.2.1 Table 6-3.

Determination of Exitway and Access Requirements.<sup>h</sup>

Occupancy Group of Building or Space	Capacity Number of Persons per unit of Width						Corridors	
	a.			b.			c.	
	Doors and Openings To Out- doors at Grade	All Other Means of Egress Doors	Stairs, Escalators	Ramps, Corridors, Exitway Passageways, Horizontal Exitways	Min. Width (inches)	Max. Dead End Length (feet)		
High Hazard	A	50	40	30	50	36	N.P.	
Storage	B-1	75	60	45	75	36	50	
	B-2	75	60	45	75	36	N.R.	
Mercantile	C	100	80	60	100	36	50	
Industrial	D	100	80	60	100	44	50	
Business	E	100	80	60	100	44	50	
Assembly	F1a	100	80	60	80	44	30	
	F1b	100	80	80	100	44	30	
	F-2	100	80	90	80	44	30	
	F-3	100	80	80	100	44	30	
	F-4	100	80	60	100	44	30	
	F-5 <sup>e</sup>	600	600	320	425	44	30	
School	G <sup>d</sup>	90	90	60	90	44	30	
Institutional	H-1	50	40	30	50	36 <sup>f</sup>	40 <sup>g</sup>	
	H-2	30	30	15	30	96	30	
Residential	L-1	50	40	30	50	36	40	
	L-2	50	40	30	50	36	40	
	L-3	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	

N.P. Not Permitted.  
N.R. No Requirements.



**NOTES on Table 6-3**

- a. Where a door opening is divided by mullions into two or more door openings, each such opening shall be measured separately in computing the number of units of egress width.
- b. Reduce listed capacity of ramps by 25 percent when slope exceeds 1 in 10.
- c. See section 612.2.
- d. Except as otherwise required for schoolhouses by the Board of Schoolhouse Structural Standards of the Commonwealth of Massachusetts.
- e. Except as otherwise required for tents in Form B-3 Regulations—Massachusetts Department of Public Safety.
- f. Applies to corridors serving patients. Other corridors shall have a minimum width of 44 inches.
- g. There shall be no patient bedrooms between an exitway and the end of the corridor (dead end).
- h. See section 611.1 and 611.2.

**610.3. Sprinkler Allowance.**—When the building is protected with an approved automatic sprinkler system complying with the requirements of article 12, and such sprinkler protection is not specifically required by this Code, the capacity per story per unit egress width may be increased fifty (50) percent above the values specified in section 610.2.1 table 6-3.

**610.4. Horizontal Exitway Allowance.**—When an approved horizontal exitway complying with the provisions of section 616 is provided in buildings of storage, mercantile, industrial, business, school and assembly occupancies, the capacity per story per unit egress width of stairways may be increased fifty (50) percent above the value specified in section 610.2.1 table 6-3; and in buildings of institutional occupancy groups, the capacity per unit egress width may be increased one hundred (100) percent.

**610.5. Combined Total Allowance.**—When both approved automatic sprinklers and horizontal exitways are provided as specified in this Code, the capacity per unit egress width of stairways may be increased seventy-five (75) percent above the values specified in section 610.2.1 table 6-3.

**610.6. Area of Refuge Allowance.**—The capacity of required area of refuge enclosed within Type A fire divisions or fire walls shall be computed on a net floor area allowance of three (3) square feet for each occupant to be accommodated therein, not including areas of stair, elevator and other shafts or courts.

## **SECTION 611.0. NUMBER OF EXITWAYS**

The following general requirements apply to buildings of all occupancy groups. More restrictive requirements that may be

provided in article 4 for special uses and occupancies shall take precedence over the general provisions of this section.

**611.1. Exitways from Floors Above and Below Grade.**—There shall be not less than two (2) approved independent exitways serving every floor area above and below the first or grade floor, at least one (1) of which shall be an interior enclosed stairway, except in one- and two-family dwellings and as modified in section 611.3 and section 621.1. Exitways in dwellings shall be so arranged that they may be reached without passing through another living unit, except as permitted for balconies in section 612.7.

**611.2. Grade Floor Exitways.**—From the first or grade floor direct exitways shall be provided to the street consisting of one (1) unit of egress width for each fifty (50) occupants on the grade floor in buildings of the high hazard occupancy group and for each one hundred (100) occupants in all other occupancy groups, in addition to the exitways from upper and lower floors.

**611.3. Buildings with One Exitway.**—Only one (1) exitway consisting of an interior enclosed stairway shall be required in buildings of the occupancy group and characteristics specified:

**611.3.1. Residential Buildings.**—

- a. In multi-family dwellings, occupancy group L-2, not more than three (3) stories and attic in height for not more than six (6) families, nor more than three thousand (3,000) square feet in area for types 1A, 1B, 2A or 2B construction nor more than two thousand four hundred (2,400) square feet in area for types 3A or 3B construction. The distance of travel to the one required exitway shall not exceed fifty (50) feet and the stairway shall be enclosed in partitions of two (2) hour fireresistance with three-quarter (3/4) hour fire doors complying with provisions of article 9 at the openings.
- b. In multi-family dwellings, occupancy group L-2, not over two (2) stories and nonhabitable attic in height, for not more than eight (8) families, nor more than four (4) families to a floor nor more than three thousand (3,000) square feet in area for all types of construction except types 2C, 3C and 4B. The distance of travel to the one (1) required exitway shall not exceed fifty (50) feet and the stairway shall be enclosed with partitions of not less than one and one-half (1-1/2) hour fireresistance

with three-quarter (3/4) hour fire doors complying with article 9 at the openings.

- c. Every sleeping room in buildings allowed by sections 611.3.1.a. and 611.3.1.b. to have only one (1) exitway, unless it has two (2) doors providing separate ways of exitway access, or has a door leading directly to the outside of the building, shall have at least one (1) outside window which can be opened from the inside without the use of tools and of such design that it may serve as an emergency exit if the normal avenues of escape are blocked, providing a clear opening of at least four hundred (400) square inches, with no dimension less than sixteen (16) inches and with the bottom of the opening not more than four (4) feet above the floor.

**611.4. Basement Recreation Rooms.**—In residential buildings (occupancy group L-1 and L-2), the basements of which are used as playrooms or for similar recreation purposes, with an occupancy load of twelve (12) or more, such areas and the exitway shall be enclosed with partitions and ceilings of not less than three-quarter (3/4) hour fireresistive construction. A direct secondary exitway from the basement to the street, shall be acceptable in lieu of the requirements for an enclosed stairway.

**611.5. Open Parking Structures.**

**611.5.1. Number of Exitways.**—Open parking structures shall have not less than two (2) exitways from each parking tier.

**611.5.2. Distance to Exitway.**—The maximum distance from any point on a parking tier to an exitway at that tier shall not exceed one hundred (100) feet if driver parked.

**611.5.3. Ramps as Exitways.**—Ramps used for the movement of vehicles need not be enclosed and may be considered as required exitways

- a. in structures not exceeding eighty-five (85) feet in height where vehicles are attendant parked, or

- b. in other structures having not less than two (2) enclosed stairways.

## **SECTION 612.0. EXITWAY ACCESS—PASSAGEWAYS, CORRIDORS, AND BALCONIES**

**612.1. Exitway Access.**—Direct exitway access shall be provided to required exitways through a continuous path consisting of aisles, corridors, balconies, or passageways kept readily accessible and unobstructed at all times and kept free of combustible contents except that in buildings classified in occupancy

groups H-1 and H-2, and schoolhouses in occupancy group G, combustible contents may be stored in noncombustible lockers and combustible bulletin boards meeting the requirements of section 922.1.2., table 9-4, shall be permitted.

**612.1.1. Turnstiles and Gates.**— Access from public areas through turnstiles, gates, rails or similar devices shall not be permitted unless they conform to the requirements of section 615.0.

**612.2. Dead Ends.**— Exitway access passageways and corridors in all stories above the first which serve more than one (1) exitway shall provide direct connection to such exitways in opposite directions from any point in the corridor so that dead ends are avoided. In no case shall the length of travel in a dead end corridor be more than the length listed in section 610.2.1 table 6-3 except that when a corridor is completely enclosed in construction having a two (2) hour fire resistance rating, with all corridor doors being self-closing and having a fire protection rating of one and one-half (1-1/2) hour, the permissible length of dead ends may be increased one hundred (100) percent above the length listed in section 610.2.1 table 6-3. Dead end distance shall be measured from the centerline of the door opening nearest to the closed end of the corridor to the center of an exitway door opening, or to the center of that point in the corridor where travel to two (2) or more exitways becomes available in two (2) directions.

### **612.3. Minimum Dimensions.**

**612.3.1. Width—Capacity.**— The minimum width and capacity of corridors shall be as listed in section 610.2.1 table 6-3. The required minimum width shall be measured in the clear between the narrowest points produced by any projections such as radiators, lockers, drinking fountains, or room or locker door swings, except that such width may be reduced by projections up to eighteen (18) inches wide to the extent of two (2) inches per unit of egress width if the total area of such projections does not exceed five (5) percent of the area of the wall on which they occur.

**612.3.2. Height.**— A clear height of seven feet six inches (7'6") shall be provided for at least seventy-five (75) percent of the floor area, with no point less than seven (7) feet in height. No projection below the ceiling shall be located so as to obstruct full view of exitway signs.

**612.3.3. Length Between Smoke Barriers.**—The maximum distance between smoke barriers that subdivide corridors shall be two hundred (200) feet for educational buildings of occupancy group G and one hundred fifty (150) feet for institutional occupancy groups H-1 and H-2. Smoke barriers shall consist of partitions constructed of noncombustible materials or fire retardant treated wood and containing smoke stop doors conforming to the following:

Smoke stop doors.—Smoke stop doors shall be self-closing, swinging doors of metal, metal covered, or one and three-quarter (1-3/4) inch bonded solid core wood with clear wire glass panels having an area of at least six hundred (600) square inches per door, except that in buildings not over two (2) stories high, smoke stop doors may be of one and three-eighths (1-3/8) inch bonded solid core wood with clear wire glass panels, unless the doors are also used as horizontal exitways in which case they shall comply with the provisions of section 616. Smoke stop doors shall close the opening completely with only such clearance as is reasonably necessary for proper operation. Smoke stop doors shall normally be in the closed position, except that they may be left open if they are arranged to close automatically by an approved device which is actuated by an interior fire alarm system meeting the requirements of article 12.

#### **612.4. Opening Protectives.**

**612.4.1. Doors.**—In buildings of H-1, H-2 or L-1 occupancy groups (institutional or hotel) more than two (2) stories in height, or with more than twenty-five (25) occupants above the first floor, all doors from rooms opening on a corridor or passageway serving as an exitway access shall be three-quarter (3/4) hour fire doors or one and three-quarter (1-3/4) inch thick bonded solid core wood doors or their approved equivalent complying with article 9.

- a. Transoms in the walls of corridors shall have the equivalent fireresistance of the door, but operable transoms shall not be permitted.
- b. Louvres shall be prohibited except in the lower third of toilet room doors when used as a source of make-up air for the toilet room ventilation required in article 5.

**612.4.2. Borrowed Lights.**—In corridors required to have a one (1) hour fireresistance rating, fixed one-quarter (1/4) inch wire glass panels may be installed in not more than twenty (20)

percent of the common wall between the corridor and any room or space, provided that no panel exceeds seven hundred and twenty (720) square inches in area.

**612.5. Changes in Level.**—Changes in level requiring less than two (2) risers in a corridor shall be by a ramp complying with section 617. Risers and treads shall comply with the requirements of section 618.

**612.6. Exterior Corridors.**—Exterior corridors shall be roofed, and shall have solid floors drained to prevent accumulations of standing water. Such floors may serve as fire canopies when so constructed. Exterior corridors shall be protected along their outer side by guards or parapets at least three (3) feet six (6) inches high. Openings in guards or parapets shall be of such dimensions as to prevent the passage of a five (5) inch diameter ball. Where the outer side of an exterior corridor is more than fifty (50) percent enclosed with solid material, it shall be treated as an interior corridor.

**612.7. Balconies.**—Balconies may serve as a means of egress from dwelling units in buildings classified in occupancy group L-2 under the following conditions:

**612.7.1.** They shall serve at least two (2) dwelling units.

**612.7.2.** They shall be constructed as required for exterior corridors, except that parapets or guards shall not be higher than four (4) feet on the outer side of the balcony.

**612.7.3.** The dwelling units served by balconies shall be separated from each other by construction having at least a two (2) hour fireresistance rating. Such separation shall extend at least three (3) feet beyond the outside face of the exterior wall of the building. An opening at least twenty (20) inches wide shall be provided between the end of this separation and the balcony parapet or guard, and the opening shall be maintained free and unobstructed for the full height of the balcony, except that privacy screens openable from either side may be permitted in the opening.

**612.7.4.** Access from dwelling units to the balconies shall be through doors having glass panels at least two (2) feet wide and four (4) feet high, without muntins, screens, or other obstructions to hinder entry by breaking the glass panels. The doors shall be lockable only from the inside by devices that can be easily released from the outside after breaking the glass. A combination lock or lock required to be opened by a key or removable device or tool shall not be used.

**SECTION 613.0. GRADE PASSAGEWAYS AND LOBBIES AS EXITWAY ELEMENTS**

Every required interior and exterior vertical exitway which does not adjoin a street shall be directly connected to the street or to an open court leading to the street by an enclosed passageway, hallway, lobby or other unobstructed exitway element, constructed as provided in this section and in section 909.0, and maintained free of all obstructions at all times. Not more than fifty (50) percent of the total number of exitways provided for a building, area or part thereof may be served by a single grade passageway, hallway, lobby or other unobstructed exitway, except as provided in section 613.8 below.

**613.1. Capacity.**—The capacity of exitway passageways, hallways, lobbies, or other unobstructed exitway elements, shall be as listed for the exitway element in section 610.2.1 table 6-3.

**613.2. Minimum Width.**—The minimum width of an exitway passageway, hallway, lobby or other unobstructed exitway element, serving one (1) vertical exitway shall be equal to the width of the vertical exitway. The minimum width of an exitway passageway serving two (2) or more vertical exitways shall be equal to seventy-five (75) percent of the width of all of the vertical exitways that it serves. Width shall be measured in the clear between the narrowest points at any projections such as radiators, door swings or pilasters.

**613.3. Height.**—Exitway passageways shall have a clear height of seven feet six inches (7'6") for at least seventy-five (75) percent of the floor area, with no point less than seven (7) feet in height. No projection below the ceiling shall be located so as to obstruct full view of exitway signs.

**613.4. Changes in Level.**—Changes in level requiring less than two (2) risers in an exitway passageway shall be by a ramp complying with section 617.0. Risers and treads shall comply with the requirements of section 618.0.

**613.5. Construction.**—The construction of exitway passageways shall be as required by section 221.1, table 2-1, for the applicable construction type of the building.

**613.6. Openings.**—No openings other than exitway doors shall be permitted in exitway passageways, except as provided in section 613.8 below.

**613.7. Interior Finish.**—The interior finish of passageways, hallways, lobbies, and other unobstructed exitway elements,

shall be in accordance with the requirements of section 922.1.2, table 9-4.

**613.8. Street Floor Lobbies.**—Street floor lobbies may be used as exitway passageways when they comply with the requirements of section 613.1 through 613.7 above subject to the following modifications:

**613.8.1. Vertical Exitways Served.**—One hundred (100) percent of the total number of vertical exitways provided for a building may be served by a street floor lobby, if egress is provided in two (2) different directions from the discharge points of all vertical exitways to open exterior spaces that are remote from each other.

**613.8.2. Width.**—Street floor lobbies serving as exitway passageways shall be increased in width to accommodate the occupant load of all communicating spaces on the lobby floor that have egress through them.

**613.8.3. Openings.**—Openings between street floor lobbies serving as exitway passageways and elevators or communicating spaces shall comply with the following:

- a. **Doors.**—All doors shall be one and one-half (1-1/2) hour self-closing fire doors, except that when the communicating space is unsprinklered and is classified in occupancy groups F, G, H or L or is completely sprinklered in accordance with the construction provisions of article 12 and is classified in occupancy groups B-2, C, D-2 or E, then three-quarter (3/4) hour self-closing fire doors may be provided. In lieu of three-quarter (3/4) hour doors, glass or other noncombustible doors may be used if installed in combination with one and one-half (1-1/2) hour automatic fire doors located on the lobby side and protected by automatic sprinklers over the doors on the room side. The maximum amount of door opening in any wall shall not exceed twenty (20) percent of the area of such wall.
- b. **Show Windows.**—Show windows facing on street floor lobbies serving as exitway passageways shall have a maximum floor area of twenty-four (24) square feet, shall be protected by automatic sprinklers complying with the construction requirements of article 12, shall be glazed by one-quarter (1/4) inch polished plate glass or equivalent, and shall be backed by construction having a two (2) hour fire-resistance rating. All openings in such back



construction shall comply with the provisions of a. above. Adjoining show windows shall be separated from each other by construction having a two (2) hour fire-resistance rating.

**613.8.4. Occupancy.**—Street floor lobbies serving as exitway passageways may be occupied by newsstands, candy and tobacco stands, information booths or similar occupancies, if such stands or booths are constructed of noncombustible materials, occupy not more than a total of five (5) percent of the net floor area of the lobby, and do not infringe upon the required clear width of the lobby at any point.

**SECTION 614.0. MEANS OF EGRESS DOORWAYS**

The requirements of this section shall apply to all doorways serving as a component or element of a required means of egress; except this section shall not apply to doorways leading to or from required stairways (see section 618.6, 620.5 and 621.3).

**614.1. Number of Doorways.**—When the occupancy load exceeds the number of persons listed in section 614.1.1 table 6-4 there shall be at least two (2) means of egress door openings as remote from each other as practicable. Such doorways shall provide independent access to separate exitways except that these doors may open upon a common access way leading to separate exitways either in opposite directions.

**614.1.1. Table 6-4. Maximum Occupant Load—For Spaces With One Door**

Occupancy Group Classification	Max. Occupant Load with One (1) Door
A .....	10
B .....	50
C .....	75
D .....	50
E .....	75
F .....	75
G .....	75
H .....	15
L .....	20

**614.2. Size of Means of Egress Doors.**—The required width of means of egress doors shall be determined from the capacity as listed in section 610.2.1 table 6-3. A door forty (40) inches wide

shall be deemed the equivalent of two (2) full units of egress width. The height of doors shall in no case be less than six and two-thirds (6-2/3) feet. In applying the provision of this Code the nominal door dimensions shall be used for computing required size of doors. The maximum width of a single door shall be forty-eight (48) inches. The minimum width shall be thirty (30) inches except as provided in article 4 or as tabulated below:

- a. Single doors opening from classrooms to corridors, thirty-six (36) inches.
- b. All door openings used by patients in buildings classified occupancy group H-2, forty-four (44) inches.
- c. Doors swinging in pairs (no mullion), forty-eight (48) inch opening.

**614.3. Location of Exitway Doors.**—The doorways opening from a building to a street or grade passageway to a street shall be located as remote as practicable from each other. The required doorways opening from a room or space within a building leading to an exitway hallway shall be located as remote as practicable from each other. The distance of exitway access travel from any point in a room or space to a required exitway door shall not exceed the limitations of section 609.3.2, table 6-2, unless otherwise specifically provided for in this Code.

**614.4. Swing of Doors.**—Except as provided in reference standard RS6-4, all means of egress doors shall be hung to swing in the direction of egress travel without obstructing the required width of egress component. Grade exitway doors shall not project more than twelve (12) inches beyond the street lot line complying with section 312.1.1. Where separate doors are provided for entrance and exitway use, and the entrance door is designed to swing only inwards under normal use, it shall be equipped with an emergency release bracket that will disengage the door operator and permit the door to swing outward under total pressure of not more than fifteen (15) pounds.

**614.5. Door Hardware.**

**614.5.1. Operation.**—Required means of egress doors shall be readily openable at all times from the side from which egress is to be made and shall not require a key to operate from that side, except that locks may be used in penal and mental institutions and areas, where required for security, and in banks, museums, jewelry stores and other places where extra safeguards are required, subject to the approval of the building official, and provided the locks are equipped with electrical release de-

vices for remote control in case of emergency. Except as otherwise approved by the building official for security requirements doors opening into interior enclosed stairs shall not be locked from either side except that doors may be locked to prevent access to the stair from the outdoors at the street floor. Hardware shall be provided on all exitway doors to hold them in a closed position against the pressure of expanding gases.

**614.5.2. Panic Proof.**—Exitway doors shall be equipped with panic proof hardware in rooms of occupancy group F-1, F-2 if the occupancy load exceeds one hundred (100) persons, F-3 and F-5 if the occupancy load exceeds three hundred (300) persons, and F-4 and G except when opening directly outdoors at grade from rooms having an occupant load of less than seventy-five (75) persons. The panic proof hardware shall be of an approved type and shall release when a pressure exceeding fifteen (15) pounds is applied to the releasing device in the direction of egress. The releasing device shall be placed at least three (3) feet but not more than four (4) feet above the floor. Required panic hardware shall not be equipped with any locking or dogging device, set screw, or other arrangement which can be used to prevent the release of the latch when pressure is applied to the releasing device.

**614.5.3. Remote Control.**—In rooms of occupancy group H-1 (institutional) occupied as places of detention, approved releasing devices with remote control shall be provided for emergency use.

**614.5.4. Fireresistance of Hardware.**—Exitway doorways of specified fireresistance rating shall include approved hardware in the assembly to comply with sections 904 and 917.

**614.5.5. Mechanical Operations.**—Where required exitway doors are arranged to be opened by mechanical devices of any kind, they shall be so constructed that the door may be opened manually and will release under a total pressure of not more than fifteen (15) pounds applied in the direction of exitway travel.

**614.6. Door Construction.**—All required exitway doors shall be self-closing fire doors complying with article 9, except for grade floor exitway doors and as herein provided for approved collapsible revolving doors and where one and three-quarter (1-3/4) inch bonded solid core wood doors are permitted.

**614.6.1. Grade Exitway Doors.**—Exitway doors at grade may be glazed with plate glass not less than seven thirty-seconds (7/32)

inches thick, or with any other approved glazing materials. Approved plate glass doors having one (1) or more unframed edges may be used provided they are constructed of tempered glass not less than one-half (1/2) inches thick.

## **SECTION 615.0. REVOLVING DOORS**

### **615.1. Limitations of Use.**

**615.1.1. Where Permitted.**—Except in places of occupancy group F (assembly) which either have an occupancy load of more than two hundred (200) or are excluded by reference standard RS6-2, and except in buildings of occupancy group H (institutional), approved automatic collapsible revolving doors when constructed and installed as herein provided shall be accepted in required exitway doorways from the first floor to the street. These automatic collapsible revolving doors shall not exceed fifty (50) percent of the required exitway capacity at any location. Approved swinging doors may be provided to furnish one-half (1/2) the required egress width in accordance with provisions of this article, and these shall be located within twenty (20) feet of the revolving door with one (1) swinging door adjacent to each side of the revolving door.

**615.1.2. Prohibited Construction.**—Braces or other devices that prevent normal operation of the automatic releasing mechanism shall be prohibited.

### **615.2. Width of Passage.**

**615.2.1. Unit Egress Width.**—Automatic collapsible revolving doors approved as an element of a required exitway shall provide a minimum of one (1) clear unit egress width of passageway through the vestibule when the leaves are in a collapsed position.

**615.2.2. Minimum Diameter**—The minimum diameter of approved revolving doors shall be adequate to provide the required clear egress width when collapsed, but in no case less than six and one-half (6-1/2) feet in diameter.

**615.3. Speed Control.**—All approved automatic collapsible revolving doors shall be equipped with an approved speed control governor adjustable to safe traffic speed as required by the approved rules, but in no case more than fifteen (15) revolutions per minute.

**615.4. Construction.**—All approved automatic collapsible revolving doors shall be constructed as follows:

**615.4.1. Operating Mechanism.**—Each wing is independently supported by a hanger with a corrosion resistant safety release which, when pressure of between sixty (60) to eighty (80) pounds is exerted simultaneously on the wings on opposite sides of the door pivot, the door wings will fold back on themselves in the direction of egress.

**615.4.2. Use of Wood.**—Where not otherwise required by the provisions of article 9, the doors may be constructed of wood or other approved materials of similar combustible characteristics with a minimum thickness of one and one-quarter (1-1/4) inches.

**615.4.3. Floor Covering.**—Approved mats or other floor coverings complying with the provisions of article 9, not more than one-half (1/2) inch thick, may be installed within the enclosure when permanently secured to the structural flooring and finishing flush with the adjacent floor area.

**615.4.4. Glazing.**—The doors shall be glazed with not less than one-quarter (1/4) inch plate glass and provided with at least one (1) push bar.

**615.5. Maintenance.**—The owner shall be responsible at all times for the operation and maintenance of revolving doors, and shall have the doors inspected at intervals not to exceed six (6) months. All parts of the doors, including the safety release and speed control mechanism, shall be maintained in good working order. Inspection reports shall be made in writing and kept on file at the premises for at least two (2) years.

## **SECTION 616.0. HORIZONTAL EXITWAYS**

A horizontal exitway is a way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a fire wall or fire partition to an area of refuge on approximately the same level in the same building, which affords safety from fire or smoke from the area of escape and areas communicating therewith.

**616.1. Horizontal Exitway Types.**—A horizontal exitway may consist of any one of the following types:

**616.1.1. Doors through walls or partitions** having at least a two (2) hour fireresistance.

**616.1.2. Balconies (open air) or exterior vestibules** leading around the end of a fire division to another fire area or building.

**616.1.3. Bridges or tunnels** between two (2) buildings.

**616.2. Door Requirements.**—When serving as horizontal exitways doors shall comply with the following:

**616.2.1. Size of openings** in fire walls or fire divisions shall comply with the provisions of section 908, but in no case shall the width of one (1) opening used as a required exitway be greater than eighty-eight (88) inches nor shall the area exceed eighty (80) square feet.

**616.2.2. Opening Protectives.**—The opening in fire walls or fire divisions which are required to have a fireresistance rating of two (2) hours shall be protected with a one and one-half (1-1/2) hour door assembly. Doors in fire divisions or fire walls having a three (3) hour or four (4) hour fireresistance rating shall be as required by section 917.

**616.2.3. Door Swing.**—Doors shall be self-closing and swinging in the direction of exitway travel and when travel is in both directions as when two (2) areas of refuge serve as areas of refuge for each other, at least two (2) door openings shall be provided, the doors of which swing in opposite directions. Double-acting doors shall not be permitted.

**616.2.4. Unlocked Doors.**—Horizontal exitway doors shall be kept unlocked and unobstructed whenever the area on either side of the horizontal exitway is occupied.

**616.3. Balcony, Bridge and Tunnel Requirements.**—When serving as horizontal exitways, balconies, bridges and tunnels shall comply with the following:

**616.3.1.** Their width shall be equal to at least the width of the doors opening on them, but in no case less than forty-four (44) inches.

**616.3.2.** They shall be enclosed at each end by doors complying with 616.2 above.

**616.3.3.** The floor level at doors shall be the same as that of the building except that the floor level of open balconies or open bridges shall be not less than five (5) inches lower.

**616.3.4.** Where there is a difference in level between the areas connected, the floors of the horizontal exitways shall be ramped not more than one (1) inch in ten (10) inches.

**616.3.5.** Exterior wall openings within thirty (30) feet horizontally of any open bridge or balcony or below any open bridge or balcony shall be provided with opening protectives having a three-quarter (3/4) hour fire protection rating.

**616.3.6.** Balconies shall not face or open on yards or courts less than twelve (12) feet wide, and shall be constructed as required for exterior corridors.

**616.3.7.** Exterior bridges shall be constructed of noncombustible materials. Interior bridges or tunnels shall be constructed of materials providing a two (2) hour fire resistance rating.

**616.4. Area of Refuge.**—The areas connected by the horizontal exitway shall be either public areas or spaces occupied by the same tenant and the area of refuge shall be adequate to house the total occupancy load of both connected areas as provided in section 610.6.

**616.5. Egress from Area of Refuge.**

**616.5.1. Stairway Exitway.**—When the horizontal exitway is not at ground level, there shall be at least one (1) interior enclosed stairway or smokeproof tower on each side of the horizontal exitway and any fire area not having a stairway accessible thereto shall be considered as part of an adjoining section with such stairway; but in no case shall the length of travel between the horizontal exitway and the required stairway exceed the requirements of section 609.3.

**616.6. Capacity.**—The capacity of horizontal exitways shall be determined by the requirements listed in section 610.2.1 table 6-3. Only the widths of doors swinging in the direction of exitway travel to the area of refuge shall be counted.

## **SECTION 617.0. EXITWAY RAMPS**

Ramps may be used as exitways components. When used in lieu of interior stairways, they shall comply with all the applicable requirements of required interior stairways as to enclosure, capacity, and limiting dimensions.

**617.1. Capacity.**—The capacity of ramps shall be as listed in section 610.2.1 table 6-3.

**617.2. Maximum Grade.**—Unless otherwise limited by regulations of the Commonwealth of Massachusetts, ramps shall not have a slope steeper than as follows: 1 in 8 except that in buildings classified in occupancy group H the slope shall not exceed 1 in 10, and except as provided in article 4 for places of assembly, in section 603.6 for building access, and in section 616.3.4 for horizontal exitways.

### **617.3. Design.**

**617.3.1. Changes in Direction.**—Ramps shall be straight with changes in direction being made at level platforms or landings, except that ramps having a slope not greater than one (1) in twelve (12) at any place, may be curved.

**617.3.2. Length.**—The sloping portion of ramps shall be at least three (3) feet but not more than thirty (30) feet long between level platforms or landings.

**617.3.3. Platforms.**—Level platforms or landings, at least as wide as the ramp, shall be provided at the bottom, at intermediate levels where required, and at the top of all ramps. Level platforms shall be provided on each side of door openings into or from ramps, having a minimum length in the direction of exitway travel of three (3) feet, and when a door swings on the platform or landing a minimum length of five (5) feet.

**617.3.4. Doors.**—Door openings into or from ramps shall comply with the requirements for stair exitway doors in section 618.6. No door shall swing over the sloping portion of a ramp.

**617.3.5. Guards and Railings.**—Guards and railings of ramps shall comply with the applicable requirements of section 618.5 except that only ramps having a slope steeper than one (1) in twelve (12) need comply with the requirements for handrails, and intermediate handrails shall not be required.

**617.3.6. Surface.**—Approved non-slip surfaces shall be provided for all exterior ramps, interior ramps exceeding a slope of one (1) in ten (10) and where the use is such as to involve or contribute to the danger of slipping.

## **SECTION 618.0. INTERIOR EXITWAY STAIRWAYS**

**618.1. Capacity of Exitway Stairs.**—The capacity of stairways and doors per unit of egress width shall be computed in accordance with section 610.2.1, table 6-3.

### **618.2. Minimum Dimensions.**

**618.2.1. Width.**—All interior required stairways shall be not less than forty-four (44) inches in width except as follows:

- a. Such width may be reduced to thirty-six (36) inches in buildings of occupancy groups L-1, L-2 and L-3 serving not more than thirty (30) occupants per stair on any floor and in buildings classified in occupancy groups B, D and E serving not more than sixty (60) persons per



stair and in exitways from boiler rooms and similar service spaces not open to the public or in general use by employees.

- b. Such width may be reduced to thirty (30) inches for unenclosed stairways located within a single dwelling unit, or when serving mezzanines or balconies having an occupant load not exceeding twenty-five (25) persons.
- c. When the boiler room is less than three hundred (300) square feet in area, housing a low pressure boiler, and is completely enclosed in two (2) hour fireresistive construction with approved opening protectives and an iron ladder or other approved direct exitway is furnished to the street, the primary exitway stairway may be omitted.

**618.2.2. Headroom.**—Headroom in a flight of stairs shall be measured vertically from an inclined plane, which contains the line of the nosing or upper front edge of each tread and extends to its intersection with a landing, to any point directly above the plane that limits the headroom of the stair or vertically from the same inclined plane up to a parallel inclined plane through a point limiting the headroom. The minimum headroom thus measured shall be seven feet zero inches (7'0") except that six feet eight inches (6'8") shall be permitted over a landing or when the parallel inclined planes are each at an angle of twenty-two and one-half (22-1/2) degrees or less with the horizontal.

**618.2.3. Restrictions.**—No stairways shall reduce in width in the direction of exitway travel.

**618.3. Landings and Platforms.**—Landings and platforms shall be provided at the head and foot of each flight of stairs, except at the head of basement stairs in one- and two-family dwellings, and shall comply with the following:

**618.3.1. Width.**—The least dimension of landings and platforms perpendicular to direction of travel shall be not less than the required width of stairway. On a straight run stair, the distance between risers of upper and lower flights at intermediate landings or platforms need not be more than forty-four (44) inches.

**618.3.2. Vertical Rise.**—In buildings of occupancy group F (assembly) and occupancy group H (institutional), the height of vertical rise shall not exceed eight and one-third (8-1/3) feet between landings and intermediate platforms. In all other buildings, no stairway shall have more than fifteen (15) nor less than three (3) risers between landings.

**618.3.3.** Landings and platforms shall be enclosed on sides by walls, grilles or guards at least three (3) feet high.

**618.4. Treads and Risers.**

**618.4.1. Dimensions.**—Treads and risers of required stairs shall be so proportioned that the sum of two (2) risers and a tread, exclusive of projection of nosing, is not less than twenty-four (24) inches nor more than twenty-five and one-half (25-1/2) inches. The maximum riser height and minimum tread width shall comply with the following:

Occupancy Group	Maximum Riser Height (inches)	Minimum Tread Width (inches)
One- and Two-Family Dwellings (Occupancy Group L-3)		
Closed Risers	8-1 4	9 plus 1-1 4 nosing
Open Risers	8-1 4	9 plus 1 2 nosing
All Other Residential (Occupancy Groups L-1 and L-2)	8	9 plus 1-1/4 nosing
Institutional (Occupancy Group H-2)	7	10 plus nosing
Assembly and Other Institutional	7-1 2	9-1 2 plus nosing
All Others	7-3 4	9-1 2 plus nosing

NOTE: Treads may be undercut a distance equal to the nosing. A nosing shall not be required when tread width is eleven (11) inches or wider.

**618.4.2. Winders.**—No winders shall be permitted in required exitway stairways except that in one- and two-family dwellings and in ornamental stairways not required as an element of an exitway, treads with a minimum width of four (4) inches and an average width of nine (9) inches may be permitted. The width of winder treads when measured eighteen (18) inches from the narrower end shall be at least equal to the width of tread above or below the winding section.

**618.4.3. Curving or Skewed Stairs.**—Curving or skewed stairs may be used as elements of required means of egress when the tread and riser relationship is in accordance with 618.4.1. when measured at a point eighteen (18) inches in from the narrow end of the tread; and no tread shall be more than three (3) inches narrower or three (3) inches wider at any point than the width established eighteen (18) inches in from the narrow end; and when the stairs have a radius of twenty-five (25) feet or more at the inner edges.

**618.5. Stairway Guards and Handrails.**—Unless otherwise specifically provided for in this code all stairways shall have continuous guards and handrails on both sides, and in addition

thereto, stairways required to be more than eighty-eight (88) inches in width shall have intermediate handrails dividing the stairway into portions not more than eighty-eight (88) inches wide except that on monumental outside stairs intermediate handrails may be omitted. No guard shall be required for inside edge of stairs which reverse direction at intermediate landings, where the horizontal distance between successive flights is not more than one (1) foot. Similarly no guard shall be required for intermediate landings which are no more than one (1) foot clear of walls.

#### **618.5.1. Handrail Details.**

Handrails may project not more than three and one-half (3-1/2) inches into the required stair width and shall provide one and one half (1-1/2) inch finger clearance.

Handrails shall be about three (3) feet, measured vertically, above the center of the treads.

Handrails shall be returned to walls or posts at each end of the stairway, except in one- and two-family dwellings.

#### **618.5.2. Guard Details.**

Guards shall be not less than forty-two (42) inches in height measured vertically above the nosing of the tread except guards protecting changes in level one (1) story or less on interior balconies and mezzanines shall be not less than thirty-six (36) inches high.

Guards shall be constructed so that the area in the plane of the guard from the top of the tread to the top of the guard is subdivided or filled in one (1) of the following methods:

- a. Two (2) horizontal rails for thirty-six (36) inches high guards with a curb at least one (1) inch high above the nosing at the edge of the stairs and at least three (3) inches high at the edge of the landings.
- b. A sufficient number of intermediate longitudinal rails constructed so that the clear distance between rails (measured at right angles to the rail) does not exceed ten (10) inches. The bottom rail shall be not more than (10) inches (measured vertically) from the tread nosing. In lieu of the proceeding, the building official may accept a two (2) rail guard when the hazard involved is otherwise minimized by the railing construction and/or limited vertical separation of the stair from a horizontal surface below.

- c. Balusters spaced not more than six (6) inches apart.
- d. Panels of wire mesh, or expanded metal, or ornamental grills which provide protection equivalent to that provided by the intermediate rails or balusters specified in the two preceding paragraphs.
- e. Walls.
- f. Any combination of the foregoing.

## **618.6. Stair Exitway Doors.**

**618.6.1. Width.**—The total width of all exitway doors (or door) to a stairway at any one landing shall be not less than the number of units of egress width required for the capacity of the stairway which services the floor or area from which the exitway doors (or door) lead; but in no case shall such a door be less than thirty (30) inches nominal width in occupancy group L-3 buildings (one- and two-family dwellings) and thirty-two (32) inches nominal width in occupancy group E (business) buildings.

**618.6.2. Direction of Swing.**—All doors shall swing on a landing in the direction of exitway travel. When open, stair exitway doors shall not reduce the width of landings to less than the minimum required for its capacity and in no case to less than thirty-six (36) inches.

**618.6.3. Door Construction.**—All doorway opening protectives, including the frames and hardware, shall be approved self-closing swinging doors complying with article 9 except in one- and two-family dwellings where one and three-quarter (1-3/4) inch bonded solid wood doors are permitted.

## **618.7. Spiral Stairways—Permitted Uses.**

**618.7.1.** Unenclosed spiral stairways of noncombustible construction, and having a tread length of at least thirty (30) inches, may be used as an element of a required means of egress from mezzanine or balcony areas not more than two hundred and fifty (250) square feet in area nor more than one-third (1/3) the area of the floor below, nor having an occupancy load exceeding twenty-five (25) persons. The maximum number of persons per unit of egress width shall be ten (10). Spiral stairways may also be used as an element of a required means of egress in a single family dwelling.

**618.7.2.** Unenclosed spiral stairways may serve as access stairs between two (2) floor levels in buildings other than occupancy group H provided that the total unenclosed area of the two (2) levels thus integrated does not exceed the allowable area for one (1) floor in section 221.2, table 2-2. Except as permitted

in 618.7.1, such stairs shall be additional to and shall not obstruct or interfere with the required means of egress. The maximum number of persons per unit of egress width shall be ten (10).

**618.8. Monumental and Service Stairways.**— Except as otherwise provided for in section 418.2.2, monumental, ornamental, service, convenience, or other supplementary stairways in buildings of other than occupancy groups D, F, and H (industrial, assembly, and institutional) providing access between not more than two adjoining stories and when not a part of a required exitway may be erected without stairway enclosures when the total unenclosed area between the fire divisions of the two levels thus integrated does not exceed the allowable area for one floor in section 221.2, table 2-2. Such stairways shall be additional to and shall not obstruct or interfere with required exitways.

**618.9. Stairway Construction.**— Unless otherwise provided herein, all required interior stairways shall be built entirely of non-combustible materials with solid risers, treads, and landing platforms and all finish floor surfaces of non-slip noncombustible materials; except that wood handrails shall be permitted, complying with the requirements of section 618.5.

**618.9.1. Strength.**— All stairways, platforms, landings and floors in areas used as a means of egress, in other than one- and two-family dwellings, shall be adequate to support a live load of one hundred (100) pounds per square foot.

**618.9.2. Enclosures.**— See section 221.1, table 2-1.

**618.9.3. Combustible Construction.**— In all buildings of type 3 or 4 construction of all occupancy groups other than assembly and institutional buildings, not over three (3) stories or forty (40) feet in height with not more than seventy-five (75) occupants above nor more than forty (40) occupants below the grade floor, the stairways and their enclosures may be constructed of wood or other approved materials of similar combustible characteristics and of adequate strength.

**618.9.4. Enclosures for Combustible Construction.**— The enclosure and underside of stairways of combustible construction, except in one- and two-family dwellings, shall be protected with fireresistive partitions and ceilings as herein required, firestopped as specified in section 877, 909 and 921; and the space below the stairs shall be kept open or shall be solidly enclosed with fireresistive partitions.

## **SECTION 619.0. ACCESS TO ROOF**

**619.1. Access.**—In buildings or in building sections more than three (3) stories or forty (40) feet in height with roofs having a slope of less than twenty (20) degrees, access to the roof shall be provided by means of a stairway or a ladder and trap door, except that access to setback roof areas may be through a door or window opening to the roof. Where the roof is used as a roof garden or for other habitable purposes, sufficient stairways shall extend to it to provide the necessary exitway facilities from the roof as required for such occupancy. Roof trap doors shall be constructed to comply with section 927.

**619.2. Roof Enclosures.**—Stairways extending through roofs shall be enclosed in roof structures of fireresistive construction meeting the requirements of section 927.

## **SECTION 620.0. SMOKEPROOF TOWERS**

**620.1.** Where used as a required exitway, smokeproof towers shall conform to the requirements of this section.

**620.2. Access.**—Exitway access to the stairway at each story shall be through a vestibule or balcony with an unobstructed width not less than the required stairway width, but not less than forty-four (44) inches in any case, open on at least one (1) side to a street, alley, yard or court with four (4) feet high guard railings across the open side. Outside vestibules or balcony floors shall be level with or installed below the building floor where climatic conditions involve possibility of door obstruction by snow or ice. No step shall be permitted into the stair enclosure.

**620.3. Court Size.**—The yard or court shall have a minimum area of two hundred (200) square feet and a minimum dimension of ten (10) feet and the exterior open side of the vestibule, balcony or landing shall have a minimum area of eighteen (18) square feet and a minimum width of thirty (30) inches.

**620.4. Interior Open Courts.**—When interior open courts are used to vent the access balcony or vestibule, special provision shall be made in the design to avoid the creation of vertical drafts resulting in negative pressures which would retard the opening of the exitway door to the stairway from the balcony or vestibule.

**620.5. Opening Protectives.**

**620.5.1. Windows.**—All window openings in the exterior wall of the building, facing on the yard or court within thirty (30) feet below or to the side of any access balcony or vestibule shall be protected with three-quarter (3/4) hour opening protectives complying with article 9.

**620.5.2. Doors.**—Door openings from building to vestibules or balconies and to the stairways shall be not less than forty-four (44) inches wide. The doors shall be capable of being opened from both sides without a key, complying with all the requirements of section 618.6 for exitway doors for stairways, except that the fireresistance rating shall be not less than one and one-half (1-1/2) hours or the approved labeled equivalent complying with article 9.

**620.6. Terminal Passageway.**—The smokeproof tower shall terminate at grade level and shall provide egress to the street independently of all other stairways. When grade passageways are used, they shall comply with the requirements of section 613; except that there shall be no openings therein other than the smokeproof tower and street exitway doorways and the enclosure walls shall be of four (4) hour fireresistive construction and the floor and roof of three (3) hour fireresistive construction.

**620.7. Construction.**—The construction of smokeproof towers shall be of walls with a four (4) hour fireresistive rating without openings other than the required doorways; with platforms, landings and balconies of not less than three (3) hour fireresistive construction and with stairways complying with all the applicable construction details specified for interior stairways in section 618.

## **SECTION 621.0. EXTERIOR EXITWAY STAIRWAYS**

**621.1. As Required Exitway.**—Exterior stairways conforming to the requirements for interior stairways in all respects, except as to enclosures and except as herein specifically modified, may be accepted as an element of a required means of egress in buildings not exceeding six (6) stories or seventy-five (75) feet in height for other than occupancy group H (institutional) provided there is at least one (1) additional approved interior stairway, except as provided in section 621.1.1 for residential buildings and section 621.3 for single exitway buildings.

Exterior stairways which are accepted as exitway elements in residential buildings of occupancy groups L-2 and L-3 shall be relieved from requirements for fire doors, but shall be provided with handrails and guards as required for interior stairs and as required by section 612.2 and shall be covered by a roof providing protection from the weather.

**621.1.1. Motel Buildings.**—In the residential portion of motels (occupancy group L-1) not more than three (3) stories and non-habitable attic or forty-five (45) feet in height, interior enclosed stairways may be omitted where at least one (1) door from each motel unit opens onto an open porch or balcony served by at least two (2) stairways so located as to provide a choice of independent, unobstructed means of egress directly to the grade. Such porches and stairways shall comply with the requirements for interior stairways as specified in section 618.0. Porches and balconies shall be not less than four and one-half (4-1/2) feet in width. The stairways shall be not less than three feet eight inches (3'8") in width and shall be located remotely from each other. The maximum travel distance from any motel unit to the nearest stairway shall be seventy-five (75) feet. Porches and stairways shall be located at least ten (10) feet from adjacent property lot lines and from other buildings on the same lot unless openings in such buildings are protected by three-quarter (3/4) hour fireresistive doors or windows.

**621.2. Guards and Canopies.**—Guards shall be provided on all exposed sides of required exterior stairways to a height of at least three feet six inches (3'6") constructed of wire or other noncombustible weather resisting mesh of such dimensions as to prevent the passage of a five (5) inch diameter ball. The top of the stairway shall be protected with a hood or canopy of metal or other approved noncombustible material.

**621.3. Opening Protectives.**

**621.3.1. Doors.**—Except as specified in section 621.1 for residential buildings, access shall be provided at each story through a three-quarter (3/4) hour self-closing fire door of the required number of unit egress widths. Doors shall open upon a landing either level with or not more than one (1) five (5) inch step below the floor.

**621.3.2. Windows.**—In buildings more than three (3) stories in height, or with an occupancy load of more than seventy-five (75) above or more than forty (40) below grade, the openings below



and within ten (10) feet horizontally of the stairway shall be protected with approved three-quarter (3/4) hour automatic fire windows.

#### **621.4. Location.**

**621.4.1. Access to Street.**—All required exterior stairways shall be located so as to lead directly to a street or open space with direct access to a street; or when located on the rear of the building may lead through a passageway at grade complying with section 613.

**621.4.2. Projection.**—In no case shall exterior stairways project beyond the street lot line.

**621.5. Construction.**—Exterior stairs shall be constructed entirely of noncombustible materials, except that handrails may be of wood and except that on buildings of type 3 or 4 construction classified in occupancy groups other than F or H, exterior stairs may be built of combustible materials when the buildings are two (2) stories or thirty (30) feet in height or less and have an occupant load not exceeding forty (40) persons per floor above the street below. Treads, landings, and platforms shall be solid and unperforated but risers may be open.

**621.6. Capacity.**—The capacity of exterior stairs shall be determined in accordance with the requirements of section 610.2.1 table 6-3.

### **SECTION 622.0. MOVING EXITWAY STAIRWAYS**

**622.1. When Acceptable.**—Moving stairways of the horizontal non-slip tread type moving in the direction of egress may be used subject to the approval of the building official as an approved exitway element in buildings of all occupancy groups except groups F and H, when constructed and approved in accordance with the requirements of this article and the provisions of article 16. When accepted as an element of a required means of egress, they shall be enclosed with fireresistive partitions as specified in section 618.

**622.1.1. Additional Requirements.**—Only escalators moving in the direction of egress may be credited as exitways, except that any escalator may be credited when it is connected to an automatic fire detection system that will cause it to stop simultaneously with the detection of fire. The detection system shall comply with the construction provisions of article 16. Where an escalator provides exitway facilities from only one floor of a

building, the automatic detection system shall be located on that floor. Where escalators provide exitway facilities from more than one floor, the detection system shall be located on all floors so served, and shall cause escalators on all floors of the section of the building that they serve to stop operating. The stopping mechanism shall operate to bring the escalator to a gradual, rather than an abrupt stop. In factories and office buildings reversible escalators may be accepted as a required element of a means of egress, provided that a readily accessible main operating panel, from which all escalator units in the exitway group may be stopped or reversed, is located on the street or ground floor adjacent to and in the same enclosure with the escalators.

**622.2. Limiting Dimensions.**

**622.2.1. Width.**—The width between moving stairway balustrades shall be not less than twenty-two (22) inches nor more than forty-eight (48) inches, measured at the narrowest point at a height of twenty-seven (27) inches vertically above the nose line of the steps. In no case shall such width exceed the width of the steps by more than thirteen (13) inches.

**622.2.2. Treads and Risers.**—The depth of the moving tread shall be not less than fifteen and three-quarters (15-3/4) inches; and the rise between treads shall not exceed eight and one-half (8-1/2) inches.

**622.3. Capacity.**—The occupancy capacity shall be computed in accordance with section 610.2.1, table 6-3 based on the following:

Units of Egress Width	Step	Minimum Width (in.) at	
		Balustrade(a)	Enclosure (b)
1-1/2	24	32	52
2	40	48	68

a. Measured 27 inches above front edge of tread.

b. Clear width above handrails.

**622.4. Landings and Platforms.**—Landings and platforms shall be provided at the top and bottom of each unit as required for interior exitway stairways.

**622.5. Railings.**—Guards shall be surmounted with moving handrails traveling at the same speed as the stairway.

**622.6. Egress.**—Means of egress to the street shall be provided as specified herein for interior stairways except that in mercantile buildings completely equipped with a two-source auto-

matic sprinkler system, moving stairways may be accepted for one-third ( $1/3$ ) the total required exitway capacity when discharging through the main grade floor area.

### **622.7. Construction.**

**622.7.1. Noncombustible Materials.**—Only noncombustible materials shall be used in the construction of moving stairways in accordance with article 16.

**622.7.2. Fireresistance.**—The enclosure shall afford the fire-resistance required for approved interior exitway stairways.

**622.7.3. Extension to Roof.**—The construction shall comply with all the applicable requirements of this Code for interior exitway stairways except that a fixed stairway or ladder and trap door may be substituted for the extension to the roof when required.

**622.7.4. Height of Travel Per Unit.**—No single moving stairway unit shall have a vertical travel of more than two (2) stories nor more than thirty-five (35) feet. Escalators shall have an inclination of not over thirty (30) degrees from the horizontal.

**622.7.5. Rate of Travel.**—The maximum speed of an escalator shall not exceed one hundred twenty-five (125) feet per minute, measured along the angle of inclination.

## **SECTION 623.0. ELEVATORS IN EXITWAYS**

Elevators shall not be allowed as exitways, nor installed in a common enclosure with exitway stairways. The path of travel of any exitway stairway shall not pass directly in front of any elevator hoistway door except as noted in section 623.1.

**623.1. Grade Corridor.**—The width of a grade corridor into which exitway stairways and elevators discharge shall not be less than three-quarters ( $3/4$ ) of the combined width for stairways and elevators; but in no case shall the width of corridor be less than five (5) feet when accommodating the discharge from five (5) or less elevators; and not less than one-half ( $1/2$ ) foot additional for each additional elevator.

## **SECTION 624.0. FIRE ESCAPES**

**624.1. Where Permitted.**—Fire escapes shall be permitted only by special order of the building official in existing buildings or structures not exceeding seventy (70) feet in height, when constructed in accordance with the approved rules and when

more adequate exitway facilities cannot be provided. The capacity of fire escapes shall be as provided in section 610.2.1, table 6-3 for stairs.

**624.2. Location.**—When located on the front of the building and projecting beyond the building line, the lowest landing shall be not less than ten (10) or more than fourteen (14) feet above grade, equipped with a counterbalanced stairway to the street and with fixed ladder to the roof. In alleyways and thoroughfares less than thirty (30) feet wide, the clearance under the lowest landing shall be not less than fourteen (14) feet.

**624.3. Construction.**—All fire escapes shall be constructed in accordance with reference standard RS6-3.

## **SECTION 625.0. DELETED**

## **SECTION 626.0. EXITWAY SIGNS AND LIGHTS**

**626.1. Size and Location.**—The location of all required exitways on every floor except in occupancy group L-3 shall be clearly indicated by approved signs reading “EXIT” with letters to be not less than five (5) inches in height with one-half ( $\frac{1}{2}$ ) inch strokes. Exitway signs shall be installed immediately above the head and on the center line of each exitway door or pair of exitway doors and visible from the immediate exitway access. Such signs shall be placed at an angle with the exitway opening if such placement is required for the signs to serve their purposes. In long corridors, in open floor areas, and in all other situations where the location of the exitway may not be readily visible or understood, directional signs shall be provided to serve as guides from all portions of the corridor or floor.

**626.2. Power Source.**—Except in buildings not provided with artificial lighting all “EXIT” signs shall be illuminated at all times when the building is occupied from independently controlled electric circuit or other source of power.

**626.3. Exitway Sign Design.**—Exitway signs shall read only “EXIT” and shall be of the externally lighted or internally lighted type, except that they may be nonilluminated in buildings not provided with artificial lighting.

**626.3.1. Externally Lighted.**—The artificial light source on externally lighted signs shall provide at least twenty-five (25) foot candles on the exposed face of the sign. Visibility of the sign shall not be obscured by the location of the light source.

**626.3.2. Internally Lighted.**—For internally lighted signs, the average initial brightness of the letters shall be at least twenty-five (25) foot lamberts, and where an illuminated background is used, its average initial brightness shall be at least two hundred and fifty (250) foot lamberts. The light source shall not be modified or changed nor shall lamp life multipliers be used so as to reduce these brightness levels.

**626.3.3. Sign Color.**—Externally lighted signs shall have either red letters on a white background or white letters on a red background (or other approved color combinations) impressed, mounted, or painted such that both letters and background shall be in a vertically flat plane. The background of internally lighted signs shall be either stenciled metal with a light gray or white color, or translucent frosted, opal glass, slow-burning plastic, or the plastic edge-glow type with white plastic separators. The letters for internally lighted signs shall be translucent red or other approved color.

**626.3.4. Durability.**—In locations where breakage may occur, exitway signs shall be of shock resistant materials, or shall otherwise be protected against breakage. The signs shall be washable, non-toxic, non-radioactive and if subjected to fire must be self-extinguishing when the flame is removed.

**626.4. Directional Sign Design.**—Directional exitway signs shall comply with all of the requirements for exitway signs in section 626.3 and shall also include a red arrow on white background or white arrow on red background (or other approved color combinations), not less than eight and one-half (8½) inches long from tail to head, with a body not less than one-half (½) inch wide. The words “THIS WAY OUT” or words of similar meaning may be added to the directional signs. Directional signs shall be suitably lighted as heretofore described in these regulations for “Exit Signs.”

**626.5. False Exits.**—Any door, passageway, stair or other means of communication that is not an exitway or that is not a way to an exitway, but is so located as to be mistaken for an exitway, shall be identified with a sign reading “NOT AN EXIT”, or shall be identified by a sign indicating its use or purpose, or shall be provided with a directional exitway sign.

**626.5.1. Mirrors.**—No full length mirror which reflects an egress shall be placed or remain unless provided with an approved guard rail at least thirty-two (32) inches from the floor.

## SECTION 627.0. MEANS OF EGRESS LIGHTING

Means of egress lighting shall be in conformance with the requirements of this section and the provisions of reference standard RS 6-3 when more restrictive.

**627.1. Artificial Lighting.**—All required means of egress, except one and two family dwellings in occupancy group L-3, shall be equipped with artificial lighting facilities to provide the intensity of illumination herein prescribed continuously during the time that conditions of occupancy of the building require that the exitways be available.

**627.2. Intensity of Illumination.**—Except as provided for in section 627.3 illumination of at least three (3) foot candles measured at the floor level shall be maintained continuously, during occupancy, in exitways and their access facilities for their full length at changes in direction in and intersections of corridors, balconies, exitway passageways, stairs, ramps, escalators, bridges, tunnels, landings and platforms. Illumination shall be so arranged that the failure of any one (1) light shall not leave any area in darkness.

**627.3. Places of Assembly.**—In places of assembly for the exhibition of motion pictures or other projections by means of directed light, the illumination of floors of exitway access areas may be reduced during such period of projection to not less than one (1) foot candle.

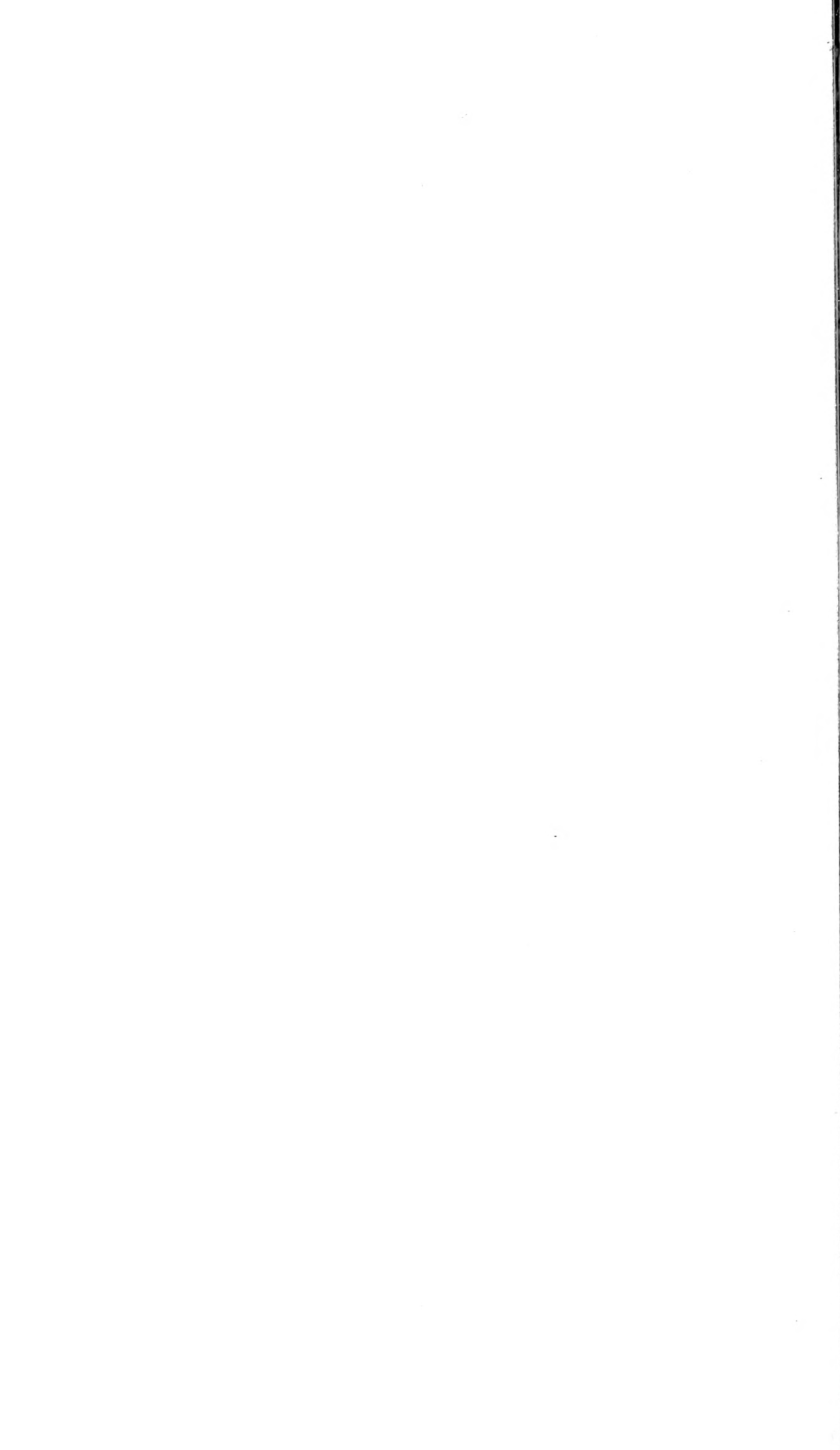
**627.4. Independent Power Source.**—Emergency lights shall be provided with a second or emergency source of current and a transfer switch which will automatically disconnect the normal service and instantly connect the emergency service when the voltage of the normal service falls below fifty (50) percent of the nominal lamp voltage and which will also automatically disconnect the emergency service and instantly connect the normal service when the voltage of the latter is restored to eighty (80) percent of the nominal lamp voltage. The emergency source of current shall be either a separate feeder from a reliable generating plant independent of that from which the normal service is taken, or an approved trickle charge wet cell battery or battery system.

**627.4.1. Duration of Illumination.**—Emergency lighting shall produce and maintain, for a period of not less than one and one-half (1½) hours, the minimum intensity of illumination.

**627.4.2. Inspection.**—Complete emergency lighting systems of batteries and generators, transfer switches and related lights shall be inspected and tested at intervals of once a week and a record kept thereof by the building owner.

**627.4.3. Location.**—All emergency lighting fixture heads shall be located, directed and locked into position so that they provide a continuous path of light to a required egress.

**627.5. Restrictions.**—Phosphorescent materials shall not be used as a method of providing illumination nor shall battery operated electric lights or portable lamps or lanterns be used as primary sources of lighting.





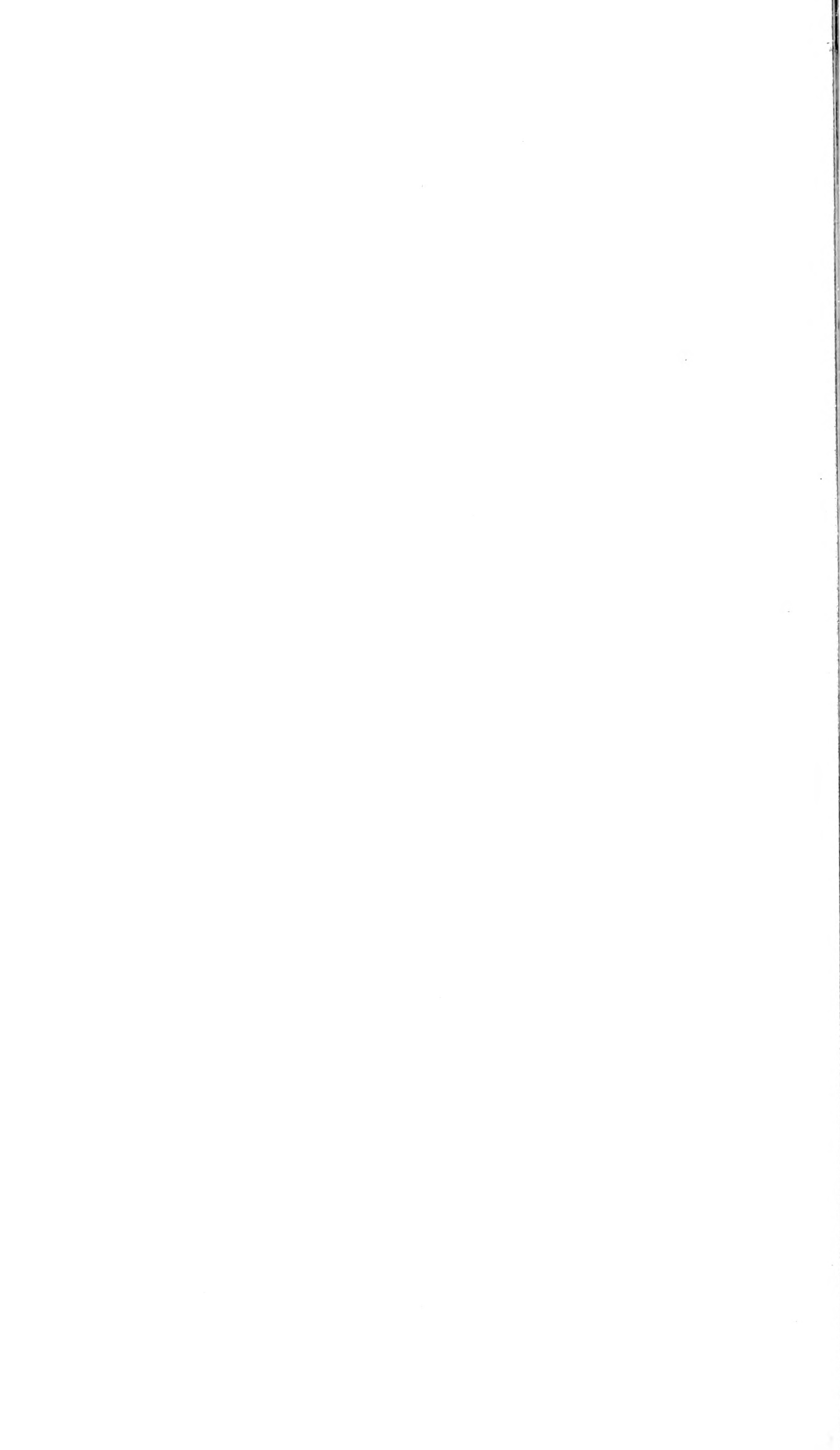
# RS 6

## REFERENCE STANDARD RS 6

### MEANS OF EGRESS

#### List of Reference Standards

- RS 6**      Mass. DPS    Form B-1    1969  
                 Regulations Applicable to Buildings
- Mass. DPS    Form B-2    1968  
                 Building Regulations for Schoolhouses, Board of  
                 Schoolhouse Structural Standards
- Mass. DPS    Form B-4    1950  
                 Installation, Use and Maintenance of Revolving  
                 Doors, Rules and Regulations
- NFPA            101            1967  
                 Life Safety Code
- RS 6-1**      NFPA            101            1967  
                 Life Safety Code
- RS 6-2**      Mass. DPS    Form B-4    1950  
                 Installation, Use and Maintenance of Revolving  
                 Doors, Rules and Regulations
- RS 6-3**      Mass. DPS    Form B-1    1969  
                 Regulations Applicable to Buildings
- RS 6-4**      Mass. DPS    Form B-2    1968  
                 Building Regulations for Schoolhouses, Board of  
                 Schoolhouse Structural Standards



## STRUCTURAL AND FOUNDATION LOADS AND STRESSES

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717.0	Unusual Wind Exposures	744.0	Concrete Filled Pipe with Steel Core (Drilled-In-Caissons)
718.0	Overturning and Sliding	745.0	Structural Steel Piles
719.0	Earthquake Load	746.0	Composite Piles
720.0	Combined Loading	747.0	Special Piles and Caissons
721.0	Live Load Reduction	748.0	Lateral Support
722.0	Allowable Working Stresses	749.0	Foundation Piers
723.0	Alloy and Special Steels	RS 7	Reference Standards
724.0	Light Weight Metals		
725.0	Bearing Pressures of Soils and Rocks		
726.0	Subsurface Explorations		

### TABLES

7-1 725.2.3 Allowable Bearing Pressures of Foundation Materials

### SECTION 700.0. SCOPE

The provisions of this article shall control the structural design of all buildings and structures and their foundations hereafter erected to insure adequate strength of all parts thereof for the safe support of all super-imposed live and special loads including wind to which they may be subjected in addition to their own dead load, without exceeding the allowable stresses prescribed in

this code. In no case shall the assumed loads be less than the minimum values established herein. The provisions of reference standard RS-7 shall become part of this article.

## **SECTION 701.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.

## **SECTION 702.0. DESIGN SAFE LOAD**

**702.1. Structural Analysis.**—The safe load for any structural member or system of construction shall be determined by accepted engineering analysis except as provided in sections 703 and 803 for tests of assemblies not capable of analysis.

**702.2. Check Tests.**—When there is reasonable doubt as to the design capacity of any structural unit or assembly, or as to the adequacy of a structure to serve the purpose for which it was intended, the building official may require that check tests be made of the assembled unit and its connections or he may accept certified reports of such tests from accredited testing authorities conducted in accordance with the approved rules.

## **SECTION 703.0. TEST SAFE LOAD**

**703.1. When Required.**—When not capable of design by accepted engineering analysis, any system of construction or structural unit and its connections shall be subjected to the tests prescribed in article 8 or to such other tests acceptable to the building official that simulate the actual loads and conditions of application that occur in normal use; or he may accept certified reports of such tests conducted by an accredited testing laboratory providing such tests meet the requirements of this code and the approved rules. Such tests shall not be required to be made on any concrete or masonry construction until it is at least sixty (60) days old.

**703.2. Test Load.**—When approved by test, every structural assembly shall sustain without failure a minimum superimposed load equal to its own dead load plus one-half (0.5) times the dead load plus one and eight-tenths (1.8) times the live load (the applied test load equals  $0.5D + 1.8L$ ), or to a load causing a stress equal to eighty (80) per cent of the yield point

of the constituent materials whichever is less. Under the approved working load, the deflection shall not exceed the limits prescribed in section 803 or 804.

## **SECTION 704.0. DESIGN LIVE LOAD**

**704.1. Required Live Load.**—The live loads to be assumed in the design of buildings and structures shall be the greatest load produced by the intended use and occupancy, but in no case less than the minimum uniformly distributed unit loads required in section 707 for specific uses.

**704.2. Loads Not Specified.**—Where the occupancy or use of a space does not conform to any of those specifically provided for in reference standard RS 7-2, the design load shall be determined by the architect or engineer and submitted to the building official for approval.

## **SECTION 705.0. DESIGN DEAD LOAD**

**705.1. Construction Materials.**—In estimating dead load for the purposes of structural design, the actual weight of the building materials or construction assemblies to be supported except as provided for in section 705.1, shall be used, but in no case less than the unit dead loads prescribed in reference standard RS 7-1.

**705.2. Service Equipment.**—The weight of all building service equipment including plumbing stacks, heating and air conditioning equipment, electrical equipment, elevators, elevator machinery, flues, and similar fixtures shall be included in the dead load supported by the structural frame. The weight of equipment that is part of the occupancy of a given area shall be considered as live load.

### **705.3. Partition Load.**

**705.3.1.** In structures in which permanent partitions occur, their weight shall be counted as affecting the design of all supporting structural members, including columns and foundations, as part of the dead load; and in those portions of office buildings in which the prescribed live load does not exceed fifty (50) pounds per square foot, allowance for partition weight shall always be made whether or not partitions are shown on plans.

**705.3.2.** If a layout of partitions is included in the building plans, the weights of the partitions and their locations shall be determined in accordance therewith; or such layout shall be

used to determine an equivalent load per square foot of floor to be applied uniformly as a superimposed dead load for purposes of design. But the allowance for partition weight in portions of buildings given to office occupancy, when expressed in pounds per square foot of floor, shall in no case be less than a minimum of two (2) pounds for each foot of story height for each square foot of floor.

**705.3.3.**—In estimating loading from actual weights of partitions it may be assumed that the partition occupies a space one (1) foot wide, and a deduction may be made of the live load displaced on this width.

**705.3.4.**—The equivalent uniform partition loads in reference standard RS 7-1 may be used in lieu of actual partition weights except for bearing partitions or partitions in toilet room areas, at stairs and elevators and similar areas where partitions are concentrated. In such cases, actual partition weights shall be used in design.

**705.3.5.**—Arch action of partitions shall not be assumed to relieve the supporting members.

## **SECTION 706.0. EXISTING BUILDINGS**

In the reconstruction, repair, extension or alteration of existing buildings, the allowable working stresses used in design shall be as follows:

**706.1. Building Extended.**—When an existing building is altered by an extension in height or area, all existing structural parts affected by the addition shall be strengthened where necessary and all new structural parts shall be designed to meet the requirements for buildings hereafter erected;

**706.2. Building Repaired.**—When repairs are made to the structural portion of an existing building, and the uncovered structural portions are found unsound, such parts shall be made to conform to the requirements for buildings hereafter erected;

**706.3. Existing Live Load.**—When an existing building heretofore approved is altered or repaired within the limitations prescribed in article 1 - Part II, the structure may be designed for the loads and stresses applicable at the time of erection, subject to the approval of the building official.

**706.4. Posted Live Load.**—Any existing building heretofore approved, in which there is no change in use to a new occupancy group requiring greater floor loads, may be posted for

the originally approved live loads, provided the building is structurally safe in all its parts and adequate for its existing use, subject to the approval of the building official.

## **SECTION 707.0. UNIT LIVE LOADS**

The plans for all buildings and structures intended for other than residential uses shall specify the live loads for which each floor or part thereof has been designed.

**707.1. Uniform Live Load.**—The minimum design values established in reference standards RS 7-2 for various occupancies or uses shall be used.

**707.2. Heavy Truck Loads.**—The floor loads for garages designed to house trucks or buses exceeding twenty thousand (20,000) pounds gross weight shall be determined by the actual load conditions; but in no case shall the assumed load be less than one hundred and fifty (150) per cent of the maximum wheel load on any point of the floor construction.

## **SECTION 708.0. CONCENTRATED LOADS**

In the design of floors and structural systems, consideration shall be given to the effects of known or probable concentrations of load to which they may be subjected.

**708.1.**—The concentrated live loads established in reference standard RS 7-2 for various occupancies or uses shall be used placed so as to produce maximum stress.

**708.2.**—Floors that support any items of machinery, electrical or mechanical equipment, or other concentrated live load in excess of one thousand (1,000) pounds (including the weights of pads or bases) shall be designed to support such weight as a concentrated load or group of concentrated loads.

**708.3. Nonconcurrency.**

**708.3.1.**—When a concentrated live load is present, the uniformly distributed load may be considered to be omitted in the area occupied by the concentrated load.

**708.3.2.**—Where reference standard RS 7-2 indicates that the concentrated live load is nonconcurrent with the uniform live load, it may be assumed that the total concentrated load is to be omitted when the uniform load is present and that the total uniform load is to be omitted when the concentrated load is present.

## SECTION 709.0. IMPACT LOADS

The unit live loads specified in section 707 shall be assumed to include adequate allowance for ordinary impact conditions. Provision shall be made in the structural design for special uses which involve moving loads, vibration and impact forces. The minimum added allowance for impact for all hangers supporting floors and balconies shall be thirty-three (33) per cent of the live loads contributing to the stress in the hanger.

**709.1. Elevators.**—All moving elevator, dumbwaiter, and escalator loads shall be increased one hundred (100) per cent for impact and the structural supports shall be designed within the limits of deflection specified by the state safety code for elevators.

**709.2. Machinery.**—Unless machinery is isolated from the support framing, the loads for supports of reciprocating or heavy power driven units shall be increased at least fifty (50) per cent and the loads for supports of light shaft or motor driven units shall be increased at least twenty-five (25) per cent to provide for impact.

**709.2.1.**—Care shall be taken to avoid near resonant conditions for machinery and other vibratory loads.

**709.3. Crane Runways.**

**709.3.1. Vertical Loads.**—Actual maximum wheel loads occurring when the crane is lifting its capacity load shall be used. To allow for impact, the lifted load shall be increased twenty-five (25) per cent or the wheel loads increased fifteen (15) per cent whichever produces greater stress condition.

**709.3.2. Horizontal Loads.**—The lateral load (due to crane trolley travel) shall be twenty (20) per cent of the sum of the capacity load and trolley weight, applied one-half ( $1/2$ ) at the top of each rail and acting in either direction normal to the runway rail. The longitudinal load (due to crane travel) shall be twenty (20) per cent of the maximum total reaction (not including impact) on the rail being considered, applied at the top of the rail and acting parallel to the runway.

**709.4. Assembly Structures.**—Seating areas in grandstands, stadiums, and similar assembly structures shall be designed to resist the simultaneous application of a horizontal swaying load of at least twenty-four (24) pounds per linear foot of seats applied in a direction parallel to the row of the seats, and of at least ten (10) pounds per linear foot of seats in a direction perpendicular to the row of the seats. When this load is used



in combination with wind for outdoor structures, the wind load shall be one-half (1/2) of the design wind load, and the provisions of article 7 relating to infrequent stress conditions shall apply to this loading condition.

#### **709.5. Monorail Beams and Supports.**

**709.5.1.**—Vertical loads shall be the sum of the capacity load and trolley weight. To allow for impact, the lifted load shall be increased ten (10) per cent for hand-operated and twenty-five (25) per cent electrically-operated trolleys.

**709.5.2.**—Longitudinal loads shall be twenty (20) per cent of the sum of the capacity load and the weight of the trolley.

**709.5.3.**—Lateral load shall be twenty (20) per cent of the sum of the capacity load and the weight of the trolley.

**709.5.4.**—Centrifugal forces shall be considered for curved tracks.

**709.6. Passenger Vehicles.**—Areas used for, and restricted by physical limitations of clearance to, the transit or parking of passenger vehicles shall be designed for the uniformly distributed and concentrated loads for parking areas for such vehicles as provided in reference standard RS 7-2, applied without impact. An exception with regard to concentrated loads is made for members or constructions which, because of physical limitations, cannot be subjected to direct load from the vehicle or from a jack or hoist used to raise or suspend the vehicle. Such members or constructions shall be designed for the loads corresponding to the actual usage.

**709.7. Truck Loads.**—Minimum loads (including vertical, lateral, and longitudinal) and the distribution thereof shall meet the applicable requirements of reference standard RS 7-3, except that impact shall be taken as ten (10) per cent of the vertical reaction.

**709.8. Railroad Equipment.**—Minimum loads (including vertical, lateral, longitudinal, and impact) and the distribution thereof shall meet the applicable requirements of reference standard RS 7-4.

#### **709.9. Heliports and Helistops.**

##### **709.9.1. Concentrated Loads.**

- a. Landing Area—Helicopter landing areas shall be designed for the most severe of the following vertical loads acting at any location:
  1. A single concentrated load equal to three-quarters (3/4) of the gross weight of the helicopter and acting on an area of one (1) square foot.

2. Concentrated loads representing the gross wheel reactions of the helicopter acting simultaneously and increased one-third (1/3) for impact.

b. Taxiing Area—Helicopter taxiing areas shall be designed for concentrated loads in accordance with (a.2) above.

**709.9.2. Uniform Live Load.**—The landing and taxiing areas shall be capable of supporting a uniformly distributed live load of forty (40) psf acting nonconcurrently with the concentrated loads.

## **SECTION 710.0. SPECIAL LOADS**

Provisions shall be made for all special loads herein prescribed and all other special loads to which the building or structure may be subjected.

**710.1. Below Grade.**—All retaining walls and other walls below grade shall be designed to resist lateral soil pressures with due allowance for hydrostatic pressure and for all superimposed vertical loads. When a portion or the whole of the adjacent soil is below a free water surface, calculations shall be based on the weight of the soil as diminished by buoyancy, plus full hydrostatic pressure.

**710.2. Hydrostatic Uplift.**—All foundation slabs and other footings subjected to water pressure shall be designed to resist a uniformly distributed uplift equal to the full hydrostatic pressure.

### **710.3. Railings and Parapets.**

**710.3.1.**—Railings and parapets around stairwells, balconies, areaways, and roofs, and other railings in similar locations other than those for places of assembly, shall be designed to resist the simultaneous application of a lateral force of forty (40) plf and a vertical load of fifty (50) plf, both applied to the top of the railing. For railings and parapets at the front of theater balconies and in similar locations in places of assembly, the lateral force shall be increased to fifty (50) plf and the vertical load to one hundred (100) plf. An exception is made for railings in one- and two- family dwellings, which shall be designed for a lateral force of twenty (20) plf plus a vertical load of twenty (20) plf, both applied at the top of the railing. The total lateral force and total vertical load shall be at least two hundred (200) pounds each.

**710.3.2.**—Intermediate and bottom rails, if provided, shall be

designed for the simultaneous application of forty (40) plf applied horizontally and fifty (50) plf applied vertically; however, lateral and vertical design loads on intermediate and bottom rails need not be considered in the design of posts and anchorages. For railings having solid panels, the panels shall be designed for a uniform lateral load of twenty (20) psf.

**710.3.3.** — Where railings or parapets support lighting fixtures, allowance shall be made for the additional loads imposed thereby.

**710.3.4.** — Railings, bumpers, or similar devices used in parking areas to resist the impact of moving vehicles shall be designed to resist a lateral load of three hundred (300) plf applied at least twenty-one (21) inches above the roadway; but in no case shall the load be less than twenty-five hundred (2,500) pounds per vehicle.

**710.4. Construction Loads and Erection Stresses.** — Construction loads and erection stresses shall be limited by appropriate construction and erection procedures to the basic design loads and corresponding working stresses required by this code for the particular occupancies and materials of construction.

**710.5. Sidewalks and Driveways.**

**710.5.1.** — All sidewalks and driveways or portions thereof that are structurally supported shall be designed for a live load of one hundred (100) psf uniformly distributed and in accordance with the provisions of article 8. Where subject to intentionally or accidentally imposed wheel loads of vehicles, such portions of sidewalks and driveways shall be designed for a uniformly distributed load of six hundred (600) psf or for the maximum vehicular wheel load that could be imposed thereon, whichever develops the greater stresses. Where the imposed load is limited by physical restrictions to the weight of passenger cars the provisions of section 709.6 shall apply.

**710.5.2.** — Appurtenant components of sidewalks and driveways, including manholes, manhole covers, vault covers, gratings, etc., shall be designed for the loads prescribed in section 710.5.1 above, and shall conform to the standards of the city agency having jurisdiction.

**710.6. Columns in Parking Areas.** — Unless specially protected, columns in parking areas subject to impact of moving vehicles shall be designed to resist the lateral load due to impact and this load shall be considered a load of infrequent occurrence. For passenger vehicles, this lateral load shall be taken as a minimum of twenty-five hundred (2,500) pounds applied at least

twenty-one (21) inches above the roadway and acting simultaneously with other design loads.

**710.7. Bins and Bunkers.**—Loads on component parts of bins and bunkers may be reduced for friction on sidewalls, but in all cases the sidewalls and their supports shall be proportioned for the probable increase of vertical loads. Where stresses would be increased in any component by arching of the fill, the effect of such arching shall be considered.

**710.8. Temperature Loads.**—The design of enclosed buildings more than two hundred and fifty (250) feet in plan dimension shall provide for the forces and/or movements resulting from an assumed expansion corresponding to a change in temperature of 40° F. For exterior exposed frames, arches or shells regardless of plan dimensions, the design shall provide for the forces and/or movements resulting from an assumed expansion and contraction corresponding to an increase or decrease in temperature of 50° F. For determining required anchorage for piping, the forces shall be determined on the basis of temperature variations for the specific service conditions. Friction forces in expansion bearings shall be considered.

**710.9. Shrinkage and Creep.**—The design of reinforced concrete components shall provide for the forces and/or movements resulting from shrinkage and creep of the concrete between contraction joints. The design of arches and similar structures shall provide for effects of shrinkage, plus rib-shortening, plus plastic flow.

## **SECTION 711.0. ROOF LOADS**

The structural components and supports of roofs and marquees shall be designed to resist wind, live, dead and other loads as prescribed below.

### **711.1. Minimum Roof Load.**

**711.1.1.**—Snow load as provided in section 712.0.

**711.1.2.**—Wind load as provided in section 715.0.

**711.1.3.**—Earthquake load as provided in section 719.0.

**711.2. Concentrated Loads.**—The provisions of section 708 shall apply.

**711.3. Overhanging Eaves.**—In other than one (1) and two (2) family dwellings overhanging eaves, cornices and other roof projections shall be designed for a uniformly distributed live

load of at least sixty (60) pounds per square foot, or more if required by the provisions of section 712.2.3.

#### **711.4. Special Loads.**

**711.4.1.**—When used for purposes such as promenades, assembly areas, or roof gardens, design shall be made for live loads corresponding to the particular usage, as indicated in reference standard RS 7-2. Such loads shall be considered as nonconcurrent with the wind load or with the live load specified in section 711.1. The design live and wind loads for roofs, as specified elsewhere in this article, shall be deemed to provide for incidental use of the roof of a building by the occupants thereof.

**711.4.2.**—Roofs shall be designed for the maximum possible depth of water that may be ponded thereon as determined by the relative levels of roof deck and overflow weirs, scuppers, edges or serviceable drains in combination with the deflected structural elements.

**711.4.3.**—Girders and roof trusses (other than joists) over garage areas regularly utilized for the repair of vehicles and over manufacturing floors or storage floors used for commercial purposes shall be capable of supporting, in addition to the specified live and wind loads, a concentrated live load of two thousand (2,000) pounds applied at any lower chord panel point for trusses, and at any point of the lower flange for girders.

**711.4.4.**—Where roofs are landscaped, the uniform design live load on the landscaped portions shall be thirty (30) psf. The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the earth. The areas adjacent to the landscaped portions shall be considered as assembly areas, unless specific provision is made to prevent such use.

**711.4.5.**—Where equipment is placed on roofs, the design shall provide for the support of such equipment.

### **SECTION 712.0. SNOW LOAD**

**712.1. Shape of Roof.**—When the effect of the shape of roof structure as determined by actual test indicates lesser or greater snow retention value than specified in this article, the roof load shall be modified accordingly. The effect of adjacent vertical surfaces shall be in accordance with section 712.2.3.

**712.1.1.**—Flat roofs and roofs having a rise of two (2) inches

or less per foot of run shall be designed to support a vertical snow load of thirty (30) pounds per square foot of horizontal projection

**712.1.2.**—Roofs having a rise of more than two (2) and less than twelve (12) inches per foot of run shall be designed for a vertical snow load of  $(34-2r)$  pounds per square foot of horizontal projection in which  $r$  is the rise in inches per foot of run.

**712.1.3.**—Roofs having a rise of twelve (12) inches or more per foot of run shall be designed for a vertical snow load of ten (10) pounds per square foot of horizontal projection.

**712.1.4.**—If the roof under consideration is above an area which is normally unheated or extensively insulated so that normal melting is prevented, then the snow load applied under sections 712.1.1, 712.1.2, 712.1.3 and 712.2.1 shall be increased by one-third ( $1/3$ ).

## **712.2. Special Snow Load Conditions.**

**712.2.1. Valleys.**—For horizontal valleys, loadings shall be increased to provide for accumulations of snow. The loading intensity shall be assumed to vary from forty-five (45) psf at the low point to fifteen (15) psf at the ridge.

**712.2.2.**—For a roof having curved or pyramidal shapes, the proposed live load shall be established by the architect or engineer subject to approval by the building official.

**712.2.3.**—For a roof having a rise of six (6) inches per foot or less, and which abuts or is not more than fifteen (15) feet away from a vertical surface that extends to a height of  $H$  feet above the roof deck, the design snow load intensity shall be modified as follows:

- a.  $H$  less than three (3) feet: No change.
- b.  $H$  at least three (3) feet but less than ten (10) feet: Design load shall vary linearly from a maximum of  $12H$  pounds per square foot at the vertical surface to a minimum at a distance of  $2H$  from the vertical surface. The minimum shall be the design load as otherwise specified in this section.
- c.  $H$  equal to ten (10) feet or more: Design load shall vary linearly from a maximum of one hundred twenty (120) pounds per square foot at the vertical surface to a minimum at a distance of twenty (20) feet from the vertical surface. The minimum shall be the design load as otherwise specified in this section.

**712.2.4.**—For roofs subject to additional snow load due to

sliding snow from adjacent inclined surfaces, the design snow load shall be established by the architect or engineer, subject to the approval of the building official.

**712.2.5.**—Whenever any building is to be constructed above the roof of an adjoining building, it shall be the duty of the person causing such building to be constructed to protect the roof, skylights and other roof outlets of the adjoining building from possible injury resulting from drift and/or sliding snow loads to the extent prescribed in sections 712.2.3 and 712.2.4. Such person shall be afforded a license to enter and inspect the adjoining building and perform such work thereon as may be necessary for such purposes; otherwise the duty of protecting the roof, skylights and other roof outlets of the adjoining building shall devolve upon the owner thereof.

## **SECTION 713.0. WIND LOAD**

The structural frame of all buildings, signs, tanks and other exposed structures or parts of structures shall be designed to resist the horizontal pressures due to wind in any direction, both inwardly and outwardly, allowing for suction on the leeward side, as provided in sections 714 to 718 inclusive.

**713.1. Torsional Resistance.**—The structural frame of all buildings and structures subjected to wind or other lateral loads shall be designed to resist the torsional moment due to eccentricity of the resultant load with respect to the center of resistance of the structure, to the wind or other lateral load.

## **SECTION 714.0. WIND ON VERTICAL SURFACES**

The wind pressures on vertical surfaces shall be those prescribed in section 714.1, distributed in accordance with section 714.2 and if required, modified by sections 714.3 and 714.4.

**714.1. Design Pressures.**—Design pressures due to wind acting on vertical surfaces shall be not less than the pressure (P) as prescribed in reference standard RS 7-5 as modified by the proper coefficients specified in this code.

**714.1.1.**—Total horizontal pressure on the walls of rectangular buildings (combining the effect of pressure on the windward walls and suction on the leeward walls) . . . 1.0 P.

**714.1.2.**—Total horizontal pressure acting simultaneously on each of any two (2) perpendicular walls of a rectangular building

(combining the effect of pressure on the windward walls and suction on the leeward walls) . . . 0.7 P.

**714.1.3.**—Pressure in or out on an exterior wall . . . 0.7 P.

**714.2. Distribution of Wind Force.**—The wind pressure shall be distributed between opposite walls, two-thirds ( $2/3$ ) as a normal pressure on the windward side and one-third ( $1/3$ ) as a normal outward suction on the leeward side.

**714.3. Wall Framing and Wall Panels.**—In buildings provided with one-third ( $1/3$ ) or more wall openings or subject to being open or broken, an internal pressure of  $2/3$  P or internal suction of  $1/3$  P whichever is critical shall be assumed to occur simultaneously with the above external pressures and suctions. For lesser amounts of wall openings the internal pressure or suction assumed shall be one-half ( $1/2$ ) of the foregoing values.

**714.4. Secondary Members.**—Secondary wall framing, wall panels, sheathing and girts and their connections shall be designed for external and internal pressures or suctions which are one and one-half ( $1-1/2$ ) times those values determined in accordance with sections 714.1, 714.2, and 714.3.

**714.5. Design Wind Load for Glass.**—Firmly supported lights of glass of four (4) square feet or more in area installed in a vertical position, or at an angle of not more than twenty (20) degrees from the vertical, shall be designed to withstand wind pressure in accordance with design criteria stated in reference standard RS 7-6.

## **SECTION 715.0. WIND LOAD ON ROOFS**

The external wind pressures and suctions specified in sections 715.1 and 715.2 shall be considered in the design of primary roof framing and trusses.

External wind pressures and suctions to be considered in the design of secondary roof framing, purlins, roof panels and sheathing and their connections shall be one and one-half ( $1-1/2$ ) times those determined in accordance with those sections. Internal pressures to be considered in the design of secondary roof framing and roof panels and sheathing and their connections shall be those specified in section 714.3 for wall elements.

**715.1. Horizontal and Pitched Roofs.**—Design wind forces on roofs, assumed to be acting on primary roof framing members, shall be not less than the pressure (P) specified in section 714.1 modified by the following coefficients.



**715.1.1.**—For roof slopes thirty (30) degrees or less, either a pressure of  $0.4P$  or a suction of  $1.2P$  over the entire roof area.

**715.1.2.**—For roof slopes of more than thirty (30) degrees either:

- a. a pressure of  $0.6P$  on the windward slope with a suction of  $0.4P$  on the leeward slope; or
- b. a pressure of  $0.9P$  on the windward slope with a zero suction on the leeward slope.

**715.2. Curved Roofs.**—The external wind forces assumed to be acting upon the primary framing members in the windward quarter of curved roofs shall be not less than the wind pressure specified in section 714.1 multiplied by the rise-to-span ratio of the entire roof arch and shall be considered as acting as an inward acting pressure. An external suction of not less than seven-tenths ( $7/10$ ) of the pressure specified in section 714.1 shall be assumed to be acting upon the center half of all arch roofs and an external suction of not less than six-tenths ( $6/10$ ) of such pressures shall be assumed to be acting upon the leeward quarter of all such roofs. All wind pressures acting upon curved roofs shall be considered as acting normal to the chord of the curved section under consideration.

**715.3. Test Determination.**—With the approval of the building official, wind force on a building may be based on shape coefficients obtained from wind tunnel tests of models or by other approved methods. Such shape coefficients shall include the full effect of openings in wall or roof surfaces. In such cases the velocity pressure “q” to be used at any height shall be taken as  $.77 p$ .

**715.4. Anchorage.**—Roof framing shall be anchored to wall framing and walls to foundations so as to resist wind uplift and sliding in excess of seventy-five (75) per cent of the dead load resistance.

**715.5. Uplift on Eaves.**—Overhanging eaves, cornices and other local projections shall be designed and constructed to withstand an upward pressure of  $1.5 P$ .

## **SECTION 716.0. WIND LOADS ON SIGNS, TANK AND RADIO TOWERS, CHIMNEYS AND OTHER BUILDING APPURTENANCES**

Minimum wind pressures to be used in the design of these and other building appurtenances shall be determined using the

value of  $P$  as specified in section 714.1 applied either in conformance with this section or in conformance with reference standard RS 7-11.

**716.1. Signs and Towers.**—The wind pressure on ground signs and towers other than radio and television towers, and their supports or portions thereof having seventy-five (75) per cent or more of solid surface shall be assumed at  $1.2 P$  and having less than seventy-five (75) per cent of solid surface shall be  $1.6 P$  of net exposed area of the structure normal to the direction of the wind.

**716.2. Roof Structures.**—The wind pressure on roof signs, tank towers, stacks, chimney and other exposed roof structures with plane surfaces shall be assumed at  $1.6 P$  applied to the net projected area of the structure normal to the direction of the wind except as provided in sections 716.3 and 716.4.

**716.3. Shielding Effect.**—No shielding effect of one element by another shall be considered when the distance between them exceeds four (4) times the projected smallest dimension of the windward element.

**716.4. Effect of Shape.**—The wind pressure on circular tanks, stacks or other circular structures shall be assumed  $0.7P$  applied to the projected area; and for hexagonal or octagonal structures  $1.0P$ .

**716.4.1.**—For special shaped structures such as spheres, guys, cables, solid girders, the design wind pressure shall be determined as provided for in section 715.3.

## **SECTION 717.0. UNUSUAL WIND EXPOSURES**

For buildings and structures located in unusually exposed positions subjected to higher wind loads than herein specified, the design wind load shall be determined by the highest values in reference standard RS 7-5.

## **SECTION 718.0. OVERTURNING AND SLIDING**

The overturning moment due to the wind load on all structures shall not exceed seventy-five (75) per cent of the moment of stability resulting from the dead load of the building, unless the building or structure is anchored to resist the excess overturning moment and the excess horizontal shear over sliding friction.

## SECTION 719.0. EARTHQUAKE LOAD

All structures except one (1) or two (2) family dwellings and minor accessory buildings shall be capable of safely withstanding the lateral forces prescribed for Zone 2 in reference standard RS 7-12.

## SECTION 720.0. COMBINED LOADING

The structural frame of all buildings shall be investigated for the combined effect of lateral and vertical loading and the individual members of the frame shall be proportioned as follows:

**720.1. With Earthquake.**—For combined stresses due to earthquake load together with dead, live and snow loads, the allowable working stress for the structural material may be increased thirty-three and one-third ( $33\frac{1}{3}$ ) per cent.

**720.2. Wind.**—For combined stresses due to wind load together with dead, live and snow loads, the allowable working stress for the structural material may be increased thirty-three and one-third ( $33\frac{1}{3}$ ) per cent.

**720.3. Minimum Section.**—The section determined for the combined loadings herein specified shall be compared with that required for dead, live and snow loads only, and the section of greatest strength shall determine that to be used in the structure.

## SECTION 721.0. LIVE LOAD REDUCTION

In all buildings and structures except places of assembly, the design live loads may be reduced on columns, piers, walls, trusses, girders and foundations as herein specified; but in no case shall a reduction be applied to the roof live load.

**721.1. Live Loads 100 Pounds or Less.**—For live loads of one hundred (100) pounds or less per square foot, the design live load on any member supporting one hundred fifty (150) square feet or more may be reduced at the rate of eight-hundredths (0.08) per cent per square foot of area supported by the members, except for reductions controlled by section 721.2. The

reduction shall exceed neither R as determined by the following formula, nor sixty (60) per cent:

$$R = 100 \times \left( \frac{D + L}{4.33L} \right)$$

in which

R = reduction in per cent

D = dead load per square feet of an area supported by the member

L = design live load per square feet of area supported by the member

### **721.2. Special Limitations.**

**721.2.1.**—For live loads exceeding one hundred (100) pounds per square foot, no reduction shall be made, except that the design live loads on columns may be reduced twenty (20) per cent.

**721.2.2.**—No live load reduction shall be permitted for the following: members and connections (other than columns, piers, and walls) supporting floor areas used for storage (including warehouses, library stacks, and record storage); and areas used as place of assembly, for manufacturing, and for retail or wholesale sales. For columns, piers, and walls supporting such floor areas the maximum live load reduction shall be twenty (20) per cent.

**721.2.3.**—No live load reduction shall be permitted for calculating shear stresses at the heads of columns in flat slab or flat plate construction.

**721.3. Foundations and Column Supports.**—The full dead load plus the reduced live load as herein prescribed shall be used in the design of foundations and of trusses or girders which support columns.

## **SECTION 722.0. ALLOWABLE WORKING STRESSES**

**722.1. Controlled Materials.**—The design and working stresses of all controlled materials as defined in section 201, or of any structural material that is identified as to manufacture and grade by mill tests or the strength and stress grade is otherwise confirmed to the satisfaction of the building official, shall conform to the specifications and methods of design of accepted engineering practice or to the approved rules in the absence of applicable standards. A building or structure may be erected in whole or in part of controlled design and materials.

**722.2. Ordinary Materials.** — The use of ordinary materials without selection and without controlled design and supervision, or when the material is not identified as to strength and stress grade, shall be limited to the average unit working stresses prescribed in reference standard RS 7-7.

**722.3. New Materials.** — For materials and assemblies which are not specifically provided for in this code the working stresses shall be specifically established by individual tests as provided in sections 703 and 803 on the actual materials to be used until adequate statistical evidence permits the establishing of generally applicable working stresses by the building official with subsequent testing limited to representative samples for quality control as he may require.

## **SECTION 723.0. ALLOY AND SPECIAL STEELS**

The use of alloy, high carbon or other special high-strength steels shall be permitted in the design and construction of buildings and structures as controlled materials and as prescribed in section 833 in accordance with provisions of referenced standards.

## **SECTION 724.0. LIGHT WEIGHT METALS**

When not specifically provided for in article 8 light weight metals and their alloys may be used in the design and construction of buildings or structures only after special approval of the building official, subject to the determination of the physical properties by tests as prescribed in article 8 and in accordance with the provisions of section 834.

## **SECTION 725.0. BEARING PRESSURES OF SOILS AND ROCKS**

All applications for permits for the construction of new buildings or structures, and for the alteration of permanent structures which require changes that may affect their foundation, shall be accompanied by a statement describing the soils in the bearing strata, including sufficient records and data to establish their character and load-bearing capacity. Such records shall be certified by a licensed professional engineer.

**725.1. Satisfactory Foundation Materials.**—The foundations of every permanent structure shall be supported by satisfactory bearing strata which shall mean:

- a. Natural strata of rock, gravel, sand, inorganic silt, inorganic clay, or any combination of these materials with the limitations stated in section 725.2.3.
- b. Compacted fills which satisfy the provisions of section 752.2.1.d.
- c. Natural strata or artificial fills which can be changed into satisfactory bearing materials by pre-consolidation with a temporary surcharge in accordance with the provisions of section 725.2.1.e.

**725.1.1.**—Where footings are supported at different levels, or at different levels from footings of adjacent structures, foundation plans shall include vertical sections showing to true scale all such variations in grade. The effect of such differences in footing levels on the bearing materials shall be considered in the design.

**725.1.2.**—Foundations shall be constructed so that freezing temperatures will not penetrate into underlying soils that contain more than five (5) per cent (by weight), passing a No. 200 mesh sieve. The foundations and grade beams of permanent structures, except when founded on sound rock, and except as otherwise provided in section 725.1.3 shall be carried down at least four (4) feet below an adjoining surface exposed to natural freezing. No foundation shall be placed on frozen soil. Foundations shall not be placed in freezing weather unless adequately protected.

**725.1.3.**—Foundations of detached garages or similar accessory structures not exceeding eight hundred (800) square feet in area and not over one (1) story high, and grade beams of all structures, need not be carried more than one (1) foot below an adjoining surface exposed to natural freezing if the underlying soil to a depth of at least four (4) feet beneath the surface, and extending at least four (4) feet outside the building, is sand, gravel, cinders, or other granular materials containing not more than five (5) per cent (by weight) passing a No. 200 mesh sieve.

**725.1.4.**—Foundations subject to hydrostatic uplift shall have adequate provisions to prevent heaving.

**725.1.5.**—Basements and cellars shall be waterproofed in a manner consistent with their proposed use up to the maximum probable ground-water level. Under boilers, furnaces, and other heat-producing apparatus, suitable insulation shall be installed

to protect the waterproofing against damage from heat as specified in articles 10 and 11. Foundations under heat-producing units shall be so insulated as to prevent evaporation of moisture from any underlying soil that is subject to shrinkage, and to protect the heads of wood piles against damage from heat.

## **725.2. Classification of Bearing Materials and Allowable Bearing Pressures.**

**725.2.1. Classification of Bearing Materials.**—The terms used in this section shall be interpreted in accordance with generally accepted engineering nomenclature. In addition, the following more specific definitions are used for bearing materials in the Greater Boston area:

### a. Rocks

Shale—A soft, fine-grained sedimentary rock.

Slate—A hard, fine-grained metamorphic rock of sedimentary origin.

Conglomerate—A hard, well cemented metamorphic rock consisting of fragments ranging from sand to gravel and cobbles set in a fine-grained matrix (locally known as Roxbury Puddingstone.)

### b. Granular Materials

Gravel—A mixture of mineral grains at least seventy (70) per cent (by weight) of which is retained on a No. 4 mesh sieve and possessing no dry strength.

Sand—A mixture of mineral grains at least seventy (70) per cent (by weight) of which passes a No. 4 mesh sieve and which contains not more than fifteen (15) per cent (by weight) passing a No. 200 mesh sieve.

Coarse Sand—A sand at least fifty (50) per cent (by weight) of which is retained on a No. 20 mesh sieve.

Medium Sand—A sand at least fifty (50) per cent (by weight) of which passes a No. 20 mesh sieve and at least fifty (50) per cent (by weight) is retained on a No. 60 mesh sieve.

Fine Sand—A sand at least fifty (50) per cent (by weight) of which passes a No. 60 mesh sieve.

Well-graded Sand and Gravel—A mixture of mineral grains which contains between twenty-five (25) per cent and seventy (70) per cent (by weight) passing a No. 4 mesh sieve, between ten (10) and forty (40) per cent (by weight) passing a No. 20 mesh sieve, and containing not more than eight (8) per cent (by weight) passing a No. 200 mesh sieve.

c. Cohesive Materials

Glacial Till—A very dense, heterogeneous mixture ranging from very fine material to coarse gravel and boulders and generally lying over bedrock. It can be identified from geological evidence and from the very high penetration resistance encountered in earth boring and sampling operations.

Clay—A fine-grained, inorganic soil possessing sufficient dry strength to form hard lumps which cannot readily be pulverized by the fingers.

Hard Clay—An inorganic clay requiring picking for removal, a fresh sample of which cannot be molded by pressure of the fingers.

Medium Clay—An inorganic clay which can be removed by spading, a fresh sample of which can be molded by a substantial pressure of the fingers.

Soft Clay—An inorganic clay, a fresh sample of which can be molded with slight pressure of the fingers.

Inorganic Silt—A fine-grained, inorganic soil consisting chiefly of grains which will pass a No. 200 mesh sieve, and possessing sufficient dry strength to form lumps which can easily be pulverized with the fingers.

Note: Dry strength is determined by drying a wet pat of soil and breaking it with the fingers.

d. Compacted Granular Fill

A fill consisting of gravel, sand-gravel mixtures, coarse or medium sand, crushed stone, or slag, containing not more than eight (8) per cent (by weight) passing a No. 200 mesh sieve and having no plasticity, shall be considered satisfactory bearing material when compacted in nine (9) inch thick layers, measured before compaction, with adjustment of water content as necessary to achieve required compaction by applying to each layer a minimum of four (4) coverages of one of the following:

1. A vibratory roller with a steel drum with minimum weight of two (2) tons with a speed not exceeding one and one-half (1-1/2) miles per hour;
2. A rubber-tired roller having four (4) wheels abreast and weighted to a total load of not less than thirty-five (35) tons;



3. With the treads of a crawler type tractor with total load of not less than thirty-five (35) tons;
4. Other types of materials, compaction equipment, and procedures as may be approved by the building official on the basis of sufficient evidence that they will achieve compacted fills having satisfactory properties.

The building official will require a competent inspector, qualified by experience and training and satisfactory to him, to be on the project at all times while fill is being placed and compacted. The inspector shall make an accurate record of the type of material used, including grain-size curves, thickness of lifts, type of compaction equipment and number of coverages, the use of water and other pertinent data. Whenever the building official or the inspector questions the suitability of a material, or the degree of compaction achieved, bearing tests shall be performed on the compacted material in accordance with the requirements of section 727.0. A copy of all these records and test data shall be filed with the building official.

c. **Preloaded Materials**

1. The building official may allow the use of certain otherwise unsatisfactory natural soils and uncompacted fills for the support of one (1) story structures, after these materials have been preloaded to effective stresses not less than one hundred and fifty (150) per cent of the effective stresses which will be induced by the structure.
2. The building official may require the loading and unloading of a sufficiently large area, conducted under the direction of a competent engineer, approved by the building official, who shall submit a report containing a program which will allow sufficient time for adequate consolidation of the material, and an analysis of the preloaded material and of the probable settlements of the structure.

**725.2.2. Bearing Values.**—The maximum pressure on soils under foundations shall not exceed values specified in section 725.2.3, table 7-1, except when determined in accordance with provisions of section 727.0 and in any case subject to the modifications of subsequent sections of this article.

### 725.2.3. Table 7-1

## Allowable Bearing Pressures of Foundation Materials

Class of Material	Allowable Bearing Pressure in Tons Per Square Foot (*)
1 Massive igneous rocks and conglomerate, all in sound condition (sound condition allows minor cracks)	100
2 Slate in sound condition (minor cracks allowed)	50
3 Shale in sound condition (minor cracks allowed)	10 ( ‡ )
4 Residual deposits of shattered or broken bedrock of any kind except shale	10
5 Glacial Till	10
6 Gravel, well-graded sand and gravel	5
7 Coarse sand	3
8 Medium sand	2
9 Fine sand	1 to 2 ( ‡ )
10 Hard clay	5
11 Medium clay	2 ( † )
12 Soft clay	1 ( † )
13 Inorganic silt, shattered shale, or any natural deposit of unusual character not provided for herein	( ‡ )
14 Compacted granular fill	2 to 5 ( ‡ )
15 Preloaded materials	( ‡ )

\* The allowable bearing pressure given in this section, or when determined in accordance with the provisions of section 727 will assure that the soils will be stressed within limits that lie safely below their strength. However, such allowable bearing pressure for Classes 9 to 12, inclusive, do not assure that the settlements will be within the tolerable limits for a given structure.

† Alternatively, the allowable bearing pressure shall be computed from the unconfined compressive strength of undisturbed samples, and shall be taken as 1.50 times that strength for round and square footings, and 1.25 times that strength for footings with length-width ratios of greater than four (4); for intermediate ratios interpolation may be used.

‡ Value to be fixed by the building official in accordance with sections 726.0. and 727.0.

## **SECTION 726.0. SUBSURFACE EXPLORATIONS**

**726.1. Where Required.**—Where borings or tests are required, they shall be made at a sufficient number of locations and to such depths, and they shall be supplemented by such field or laboratory tests and engineering analyses, as are necessary in the opinion of the building official. When it is proposed to support the structure directly on bedrock, the building official may require drill holes or core borings to be made into the rock to a sufficient depth to prove that bedrock has been reached.

**726.2. Soil Samples and Borings Reports.**—Samples of the strata penetrated in test borings or test pits, representing the natural disposition and conditions at the site, shall be available for examination of the building official. Wash or bucket samples shall not be accepted. Duplicate copies of the results obtained from all completed and uncompleted borings, plotted to a true relative elevation and to scale and of all test results or other pertinent soil data shall be filed with the building official.

## **SECTION 727.0. BEARING TEST AND SETTLEMENT ANALYSES**

Whenever the allowable bearing pressure on bearing materials, or the load bearing capacity of single piles or groups of piles is in doubt, the building official may require load tests and/or settlement analyses to be made at the expense of the applicant and the results analyzed under the direction of a foundation engineer approved by the building official.

**727.1. Approval of Test Method.**—The apparatus and procedure used shall be approved by the building official before they are used. A complete record of the test results together with a soil profile shall be filed by the licensed engineer who shall have a fully qualified representative on the site during all boring and test operations.

**727.2. Loading Equipment.**—The load shall be applied by direct weight or by means of a recently calibrated jack. Each load shall be maintained constant for the required period with an accuracy of plus or minus three (3.0) per cent.

**727.2.1. Area.**—For bearing materials of Classes 1 to 5, inclusive, the loaded area shall be not less than one (1) square foot and for other classes not less than four (4) square feet.

**727.3. Loading Procedure.**—The application of the test load shall be in steps equal to not more than one-half ( $1/2$ ) the contemplated design load, to at least twice the contemplated design load, except as provided in section 727.7. The unloading shall be in at least two (2) steps, to the design load and then to zero (0) load. During the loading cycle the contemplated design load and twice the contemplated design load shall be maintained constant for at least twenty-four (24) hours and until the rate of settlement or rebound does not exceed two hundredths (.02) of an inch per twenty-four (24) hours. The load for all other load steps including the zero (0) load at the end of the test shall be maintained constant for a period of not less than four (4) hours. Sufficient readings for each load step shall be made to define properly the time-deflection curve.

**727.4. Measurements.**—Observation of vertical movement shall be made with dial extensometers graduated to at least one thousandth (.001) of an inch. The readings shall be sufficient in number to define the progress of the settlement or rebound and shall be referred to a beam, the ends of which rest on or are fixed to reliable supports located at least eight (8) feet from the center of the test. In addition, the elevation of the supports shall be checked frequently with reference to a fixed benchmark. The entire measuring setup shall be protected against direct sunlight, frost action, and other disturbances that might affect its reliability. Temperature readings, both inside and outside the test enclosure, shall be made when the vertical movements are recorded.

**727.5. Additional Requirements for Soil Bearing Tests.**—Bearing tests shall be applied at the elevations of the proposed bearing surfaces of the structure, except that the load may be applied directly on the surface of compacted granular material, Class 14. The excavation immediately surrounding an area to be tested shall be made no deeper than one (1) foot above the plane of application of the test. The test plate shall be placed with uniform bearing. For the duration of the test, the material surrounding the test area shall be protected effectively against evaporation and frost action.

**727.6. Determination of Design Load.**—The proposed design load shall be allowed provided that the requirements of section 725 are fulfilled and the settlements under the design load and twice the design load do not exceed three-eighths ( $3/8$ ) of an inch and one (1) inch, respectively.

**727.7. Additional Requirements for Pile Load Tests.**—A single pile shall be load tested to not less than twice the design load. When two (2) or more piles are to be tested as a group, the total load shall be not less than one and one-half (1-1/2) times the design load for the group.

Provided that the load-settlement curve shows no sign of failure and provided that the permanent settlement of the top of the pile, after removal of all load at the completion of the test, does not exceed one-half (1/2) inch, the maximum design load shall be the load allowed in this part for the type of pile or one-half (1/2) of the maximum applied load, whichever is less.

Whenever the soil conditions are such that substantial driving resistance and/or significant support of the pile test load is derived from soil strata overlying the intended bearing stratum this support shall be removed or the results of the pile test shall be analyzed so as to evaluate the actual support furnished by the bearing stratum.

**727.8. Application of Pile Load Test Results.**—The results of the load test can be applied to other piles within the area of substantially similar sub-soil conditions as that for the test pile, providing the performance of the test pile has been satisfactory and the remaining piles are of the same type, shape and size as the test pile; are installed using the same methods and equipment and are driven into the same bearing strata as the load tested pile to an equal or greater penetration resistance.

**727.9. Settlement Analysis.**—Whenever a structure is to be supported by medium or soft clay (materials of classes 11 and 12), the settlements of the structure and of neighboring structures due to consolidation of the clay shall be given careful consideration, particularly if there are large variations in thickness of the clay or the structure has substantial variation in net load at foundation grade. The building official may require a settlement analysis to be made by a competent engineer with specialized training and experience in soil mechanics in case the live and dead loads of the structure, as specified in article 7, minus the weight of the excavated material, induce a maximum stress greater than three hundred (300) pounds per square foot at midheight of the underlying soft clay.

**727.9.1.**—The settlement analysis will be based on a computation of the net increase in stress that will be induced by the structure and realistically appraised live loads, after deducting the weight

of excavated material under which the clay was fully consolidated. The effects of fill loads within the building area or fill and other loads adjacent to the building shall be included in the settlement analysis. The appraisal of the live loads may be based on surveys of actual live loads of existing buildings with similar occupancy. The soil compressibility may be derived using one or more of the following methods:

- a. A review of settlement records and behavior of other buildings in Greater Boston having similar subsoil profiles.
- b. Consolidation tests on undisturbed specimens with a diameter of at least two and one-half (2-1/2) inches. The report shall include a description of the method of sampling and of the quality of the samples.
- c. Consolidation test data from other projects in Greater Boston where the clay is found to be similar when compared on the basis of detailed description of undisturbed soil samples, the natural water content and the liquid and plastic limits.

**727.9.2.**—Should the analysis indicate that the settlements would cause excessive stresses in the structure or would impair its usefulness, the design of the foundation and/or the superstructure shall be modified so that the anticipated settlements will be reduced to tolerable values.

## **SECTION 728.0. ALLOWABLE FOUNDATION PRESSURE**

The maximum allowable pressures on foundation materials shall be in accordance with section 725.0 and as modified herein.

**728.1. Rock Foundations.**—Where subsurface explorations at the project site indicate variations or doubtful characteristics in the structure of the rock upon which it is proposed to construct foundations, a sufficient number of borings shall be made to a depth of not less than ten (10) feet below the level of the footings to provide assurance of the soundness of the foundation bed and its bearing capacity.

**728.2. Bearing Pressure on Rock.**—The tabulated bearing pressures for rocks of Classes 1 and 3, inclusive, shall apply where the loaded area is on the surface of sound rock. Where the loaded area is below such surface these values may be increased ten (10) per cent for each foot of additional depth, but shall not exceed three (3) times the tabulated values.

**728.3. Bearing Pressures for Classes 4 to 9, Inclusive.**—The allowable bearing pressures for materials of Classes 4 to 9, inclusive, may exceed the tabulated values by five (5) per cent for each foot of depth of the loaded area below the minimum required in section 729.0 but shall not exceed twice the tabulated values. For areas of foundations smaller than three (3) feet in least lateral dimension, the allowable design bearing pressures shall be one-third ( $1/3$ ) of the allowable bearing pressures multiplied by the least lateral dimension in feet.

**728.4. Bearing Pressures on Clay.**—The tabulated bearing pressures for Classes 10 to 12, inclusive, shall apply only to pressures directly under individual footings, walls, and piers; and in case structures are founded on or are underlain by deposits of these classes, the total load over the area of any one bay or other major portion of the structure, minus the weight of all materials removed, divided by the area, shall not exceed one-half ( $1/2$ ) the tabulated bearing pressures.

**728.5. Vertical Pressures.**—The computed vertical pressure at any level beneath a foundation shall not exceed the allowable bearing pressures for the material at that level. Computation of the vertical pressure in the bearing materials at any depth below a foundation shall be made on the assumption that the load is spread uniformly at an angle of sixty (60) degrees with the horizontal; but the area considered as supporting the load shall not extend beyond the intersection of sixty (60) degree planes of adjacent foundations.

**728.6. Investigation of Settlement.**—Whenever there is any doubt about the settlements of a proposed structure or the effect on neighboring structures, the building official shall require that the magnitude and distribution of the probable settlements be investigated. This requirement shall also apply to slabs on grade.

**728.7. Disturbance of Bearing Materials.**—Whenever the bearing materials are disturbed from any cause, for example by the inward or upward flow of water and/or by construction activities, the extent of the disturbance shall be evaluated and appropriate remedial measures taken, satisfactory to the building official.

## **SECTION 729.0. SPREAD FOUNDATIONS**

Except when erected upon sound bedrock or when protected from frost, foundation walls, piers and other permanent sup-

ports of all buildings and structures shall extend a minimum of four (4) feet below finished grade except as provided in section 725.1.3. Spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing pressure of the soil.

**729.1. Depth of Spread Foundations.**—The bottom surface of any footing resting on material of classes 4 to 15, inclusive, shall be at least eighteen (18) inches below the lowest ground surface or the surface of a floor slab bearing directly on the soil immediately adjacent to the footing.

**729.2. Light Structures.**—One-story structures without masonry walls and not exceeding eight hundred (800) square feet in area may be founded on a layer of satisfactory bearing material not less than three (3) feet thick, which is underlain by highly compressible material, provided that the stresses induced in the unsatisfactory material by the live and dead loads of the structure and the weight of any new fill, within or adjacent to the building area, will not exceed two hundred and fifty (250) pounds per square foot.

## **SECTION 730.0. FOOTING DESIGN**

**730.1. Design Loads.**—The loads to be used in computing the pressure upon bearing materials directly underlying foundations shall be the live and dead loads of the structure, as specified in section 721 including the weight of the foundations and of any immediately overlying material, but deducting from the resulting pressure per square foot the total weight of a one (1) square foot column of soil, including the water in its voids, which extends from the lowest immediately adjacent surface of the soil to the bottom of the footing, pier or mat. Foundations shall be constructed so as to resist the maximum probable hydrostatic pressures.

**730.2. Pressure Due to Lateral Loads.**—Where the pressure on the bearing material due to wind or other lateral loads is less than one-third ( $1/3$ ) of that due to dead and live loads, it may be neglected in the foundation design. Where this ratio exceeds one-third ( $1/3$ ) foundations shall be so proportioned that the pressure due to combined dead, live, wind loads, and other lateral loads shall not exceed the allowable bearing pressures by more than one-third ( $1/3$ ).



**730.3. Earthquake Loads.**—Special provision shall be made in the foundation design to comply with the provisions of section 719.

**730.4. Vibratory Loads.**—Where machinery or other vibrations may be transmitted through the foundations, consideration shall be given in the design of the footings to prevent detrimental disturbance of the soil.

**730.5. Eccentric Loads.**—Eccentricity of loadings in foundations shall be fully investigated and the maximum pressure on the basis of straight-line distribution shall not exceed the allowable bearing pressures.

## **SECTION 731.0. TIMBER FOOTINGS**

**731.1. Where Permitted.**—Timber footings may be used only for wood frame structures. Such footings shall be placed entirely below the permanent water level unless the timber is treated in accordance with the provisions of section 740.5.

**731.2. Untreated Timber.**—The compressive stresses perpendicular to the grain in untreated timber footings, supported upon piles, with the pile cut-off and the top of the footing and capping entirely below permanent ground water or mean low water level, shall not exceed seventy (70) per cent of the allowable stresses for the species and grade of lumber in accordance with the provisions of section 853.

## **SECTION 732.0. STEEL GRILLAGES**

Structural steel grillage foundations shall have at least six (6) inches of concrete cover below the bottom of the steel and shall have at least four (4) inches of concrete cover above the steel and between the sides of the steel and the adjacent soil.

## **SECTION 733.0. UNREINFORCED CONCRETE FOUNDATIONS.**

**733.1. Concrete Strength.**—Concrete in unreinforced foundation footings shall be so proportioned as to develop an ultimate compressive strength of not less than two thousand (2000) pounds per square inch at twenty-eight (28) days.

**733.2. Placement.**—No concrete for foundations shall be poured through water. When placed under or in the presence of water,

the concrete shall be deposited by approved and properly operated equipment which insures minimum segregation of the mix and negligible turbulence of the water.

**733.3. Dimensions.**—In unreinforced concrete footings, the edge thickness shall be not less than twelve (12) inches for footings on soil or rock; except for wood frame buildings up to two (2) stories in height, these thicknesses may be reduced to eight (8) inches.

**733.4. Protection.**—Concrete footings shall be protected from freezing during construction and for a period of not less than five (5) days thereafter and in no case shall water be allowed to flow through the deposited concrete.

## **SECTION 734.0. MASONRY UNIT FOOTINGS**

**734.1. Dimensions.**—Masonry unit footings shall be laid in cement mortar or cement-lime mortar complying with section 816 and the depth shall be not less than twice the total projection beyond the wall, pier or column; and the width shall be not less than twelve (12) inches wider than the wall supported thereon.

**734.2. Offsets.**—The maximum offset of each course in brick foundation walls stepped up from the footings shall be one and one-half (1-1/2) inches if laid in single courses, and three (3) inches if laid in double courses.

## **SECTION 735.0. REINFORCED CONCRETE FOUNDATIONS**

**735.1. Design.**—Reinforced concrete foundations shall comply with sections 841, 842, 843 and 844 and the applicable reference standards therein listed for the design of reinforced concrete.

**735.2. Pile Caps.**—The minimum distance from the edge of the cap to the nearest pile surface shall be six (6) inches and there shall be at least two (2) inches of concrete between the top of the pile and the steel reinforcement of the cap. The pile caps shall extend not less than three (3) inches below the pile cut-off.

**735.3. Protection.**—When the concrete is deposited directly against the ground, the reinforcement shall have a minimum cover of three (3) inches, at all other surfaces of foundation concrete, the reinforcement shall have a minimum cover of two (2) inches.

## SECTION 736.0. FLOATING FOUNDATIONS

The design of floating foundations shall include a settlement analysis in accordance with the provisions of section 727.9.

## SECTION 737.0. PILE FOUNDATIONS

**737.1. Site Investigation.**—In addition to the provisions of section 726.0, the building site shall be investigated for all conditions which might promote deterioration of pile foundations, and approved protective measures meeting the requirements of section 738.0 shall be taken to prevent corrosion or other destructive action from deleterious conditions.

**737.2. Spacing.**—The minimum center-to-center spacing of piles shall be not less than twice the diameter at cut-off of a round pile, nor less than one and three-quarter (1-3/4) times the diagonal dimension of a rectangular pile. When driven to or penetrating into rock, the spacing shall be not less than twenty-four (24) inches. When receiving principal support from end-bearing on materials other than rock or through frictional resistance, the spacing shall be not less than thirty (30) inches.

**737.3. Walls.**—All piles in wall foundations shall be staggered about the center line of the wall at a minimum distance of one-half (1/2) the top diameter therefrom. A foundation wall restrained laterally so as to ensure stability both during and after construction may be supported by a single row of piles.

**737.4. Isolated Columns.**—An isolated column when supported by piles shall rest upon not less than three (3) piles, at least one (1) of which is offset; except that for one (1) story buildings an isolated column may rest upon two (2) piles when its axis is not more than one and one-half (1-1/2) inches off the line connecting the centers of the two (2) piles, or upon a single pile when other than wood or wood-composite piles are used and its axis is not more than one and one-half (1-1/2) inches off the center of the pile, provided the top of the pile is laterally supported.

**737.5. Minimum Dimensions.**—Piles of uniform cross section shall have a minimum outside nominal dimension of ten (10) inches except as provided in section 741.2.1. Tapered concrete piles shall have a minimum butt diameter at cut-off of twelve (12) inches and a diameter of not less than eight (8) inches measured one (1) foot above the tip.

**737.6. Splices.**—Splices shall be avoided insofar as practicable. Where used, splices shall be such that the resultant vertical and lateral loads at the splices are adequately transmitted. Splices shall be so constructed as to provide and maintain true alignment and position of the component parts of the pile during installation and subsequent thereto. The ends of each section of steel pipe or other steel elements shall be cut perpendicular to the axis and bearing surfaces shall be true-fitted with milled or ground faces or by flame cutting or other approved method. Splices shall develop one hundred (100) per cent of the strength of pile section in whatever state of stress.

**737.7. Jetting.**—Jetted piles shall be driven to the required load resistance as determined by the application of the approved pile driving formula in section 739.2.1, after the flow of jet water has stopped.

**737.8. Precautions.**—When piles have been damaged in driving, or driven in locations and alignment other than those indicated on the plans, or that have capacities less than required by the design, the affected pile groups and pile caps shall be investigated and if necessary, the pile groups or pile caps shall be redesigned or additional piles shall be driven to replace the defective piles. Piles shall be driven to embedment in the supporting stratum, as determined by borings.

**737.8.1. Method of Driving.**—The method of driving shall be such as not to impair the strength of the pile and shall meet with the approval of the building official. Measurements to determine the value of “s”, as defined in section 739.2.1.a, shall not be made immediately after the introduction of fresh cushion block material, or an interruption in the driving operation or when the pile head is shattered, broomed, crumpled, or otherwise damaged.

The cushion block, where used, shall be of hardwood with its grains parallel with the axis of the pile and be enclosed in a tight-fitting steel housing, or a demonstrated equal. Wood chips, pieces of rope, old hose, or automobile tires and similar materials shall not be used as a cushion block.

Shattered, broomed, crumpled, or otherwise damaged pile heads shall be cut back to sound material before continuing the driving.

In case a follower is used, it shall be of steel, seasoned white oak or hickory, equipped on its lower end with a metal socket

or hood suitable for encasing the pile head and to protect it from being damaged during driving.

**737.8.2. Pile Heave.**—Where piles are driven through soft soil to hard bearing material providing high point resistance, the grades of all piles or pile casings previously driven or redriven shall be measured to detect heave; and if heave of one-half (1/2) inch or more occurs in any pile or pile casing, such pile or pile casing shall be redriven to its original point elevation and thereafter to the required final driving resistance. A preaugered hole for each pile may be used, as required, to reduce detrimental heave and negative friction.

**737.8.3. Records.**—The owner shall engage a competent inspector, qualified by experience and training and satisfactory to the building official to be present at all times while piles are being driven and to inspect all work in connection with the piles. The inspector shall make an accurate record of the material and the principal dimensions of each pile, of the weight and fall of the ram, the type, size, and make of hammer, the number of blows per minute, the energy per blow, the number of blows per inch for the last six (6) inches of driving, together with the grades at point and cut-off. A copy of these records shall be filed in the office of the building official.

## **SECTION 738.0. CORROSION PROTECTION**

Where boring records, previous experience, or site investigations indicate any condition which might promote deterioration or possible deleterious action on pile materials due to soil constituents, changing water levels or other causes such pile materials shall be adequately protected as stated herein.

**738.1. Wood Preservative Treatments.**—The preservative treatment of timber piles shall comply with the provisions of section 740.5 and the applicable standards in reference standard RS 7-9.

**738.2. Steel and Steel-Concrete Piles.**—At locations where steel and steel-concrete piles will be in contact with sea water or any other material that is known to be corrosive to steel, one of the following procedures shall be used:

- a. Remove all such objectionable material.
- b. Effectively protect the steel surface from pile cut-off grade to a grade fifteen (15) feet below the bottom of the objectionable materials by means of:

1. Cathodic protection as approved by the building official; or
2. An approved encasement of not less than three (3) inches of dense concrete; or
3. An effective protective coating subject to the approval of the building official; or
4. Deducting one-eighth (1/8) inch in thickness of material from exposed surfaces when computing the area of steel for support of load.

## **SECTION 739.0. ALLOWABLE PILE LOADS**

The allowable load on piles shall be determined by the applicable formulas complying with accepted engineering practice and as stated herein. The maximum load capacity shall be limited by the supporting capacity as obtained from bearing upon or embedment in bearing materials as defined in sections 725 and 728 but in no case shall the load exceed the capacity of the pile designed in accordance with the provisions of section 739.1 and the requirements of article 8 for the construction materials involved.

**739.1. Lateral Support of Axially Loaded Piles.**—The length of a pile below the ground surface shall be considered as a plain column with continuous lateral support. The length above the ground surface shall be designed as an unsupported column in accordance with the provisions of section 748.

**739.2. Determination of Allowable Load.**—In the absence of capacities based on load tests, except for the type of piles covered in sections 742.2 and 744.0 the load on a single pile shall not exceed the higher of the two (2) values determined in accordance with sections 739.2.1 and 739.2.2, nor the maximum loads on piles as provided in sections 739.2.3 and 740.0 thru 746.0.

### **739.2.1. Driving Formula**

- a. Where the design load capacity of the pile does not exceed fifty (50) tons, the allowable load may be computed by means of the following driving formula:

$$R = \frac{1.7E}{s + 0.1\sqrt{\frac{W_p}{W_r}}}$$

where

R = allowable pile load in pounds

$E$  = energy per blow in foot-pounds which for drop hammers is the product of the weight in pounds of the hammer and the height of fall in feet, and which for other types of hammers may be taken as that established by the hammer manufacturer. For batter piles, proper allowance shall be made for the resultant loss of energy.

$\frac{W_p}{W_r}$  = the ratio of the weight  $W_p$  of the pile and other driven parts to the weight  $W_r$  of the striking part of the hammer, except that this ratio shall not be entered into the formula as less than unity.

$s$  = the average penetration in inches per blow for the final six (6) inches of driving, except that if an abrupt high increase in resistance is encountered, "s" shall be taken as the average penetration per blow for the last five (5) blows. The minimum value of "s" which may be used in the formula is five hundredths ( $5/100$ ) of an inch.

- b. When the design load capacity of a pile exceeds fifty (50) tons the required driving resistance shall be increased, above that required by the driving formula, in section 739.2.1.a, based on load tests or past experience under similar conditions.
- c. The energy  $E$  per blow in foot-pounds delivered by the hammer shall be numerically not less than fourteen (14) per cent of  $R$  in pounds and  $\left(\frac{W_p}{W_r}\right)$  shall not be greater than 3.5.
- d. The value of "s" must be determined with the hammer operating at one hundred (100) per cent of the rated number of blows per minute for which the hammer is designed.
- e. Any driving resistance developed in strata overlying the bearing material shall be discounted.
- f. If the driving of the pile has been interrupted for more than one (1) hour, the value of "s" shall not be determined until the pile is driven at least an additional twelve (12) inches, except when it encounters refusal on or in a material of Classes 1 to 5, inclusive.
- g. When the constant tapered portion of a pile, including a timber pile, is driven through a layer of gravel, sand, or

hard clay (Classes 6 to 10, inclusive, and Class 14) exceeding five (5) feet in thickness, and through an underlying soft stratum, the bearing capacity shall not be determined in accordance with the driving formula, unless jetting is used during the entire driving of the tapered portion of the pile through the layer of gravel, sand, hard clay, or Class 14 material, or unless a hole is pre-excavated through said layer for each pile.

**739.2.2. Friction Formula in Clay.**—The allowable load on a pile stopped in inorganic clay may be based on a friction value of five hundred (500) pounds per square foot of embedded pile surface for a design load not to exceed twenty-two (22) tons, or on a friction value determined from pile load tests. The embedded length shall be the length of the pile below the surface of the inorganic clay, or below the surface of immediately overlying satisfactory bearing material. The area of embedded pile surface shall be computed by multiplying the embedded length by the perimeter of the smallest circle or polygon that can be circumscribed around the average section of the embedded length of the pile. The method of determining the allowable load described in this paragraph shall not be used for a pile in which the drive-pipe is withdrawn or for piles which are driven through the clay to or into firmer bearing materials.

In case these piles are in clusters the allowable load shall be computed for the smaller of the following two (2) areas: (1) the sum of the embedded pile surfaces of individual piles; (2) the area obtained by multiplying the perimeter of the polygon circumscribing the cluster at the surface of the satisfactory bearing material by the average embedded length of pile.

**739.2.3. Jacked Piles.**—The allowable load on a single pile installed by jacking shall not exceed one-half ( $1/2$ ) the load applied to the pile at the completion of jacking, provided that the final load is kept constant for a period of four (4) hours and that the settlement during that period does not exceed one-twentieth ( $1/20$ ) of an inch.

**739.3. Negative Friction.**—Where a pile or a group of piles is placed in subsiding fill or soil, the effect of the downward frictional forces shall be given consideration in the design.

**739.4. Limiting Load.**—Where weaker materials underlie the bearing material into which the piles are driven, the allowable pile load shall be limited by the provision that the vertical pressures in such underlying materials produced by the loads on



all piles in a foundation shall not exceed the allowable bearing pressures of such materials as established by analysis applying accepted principals of soil mechanics. Piles or pile groups shall be assumed to transfer their loads to the underlying materials by spreading the load uniformly at an angle of sixty (60) degrees with the horizontal, starting at a polygon circumscribing the piles at the top of the satisfactory bearing material in which they are embedded; but the area considered as supporting the load shall not extend beyond the intersection of the sixty (60) degree planes of adjacent piles or pile groups.

**739.4.1.**—The allowable load on a pile shall not be limited to the load obtained by multiplying its point area by the allowable bearing pressure given in section 725.0.

## **SECTION 740.0. TIMBER PILES**

**740.1. Species.**—Piles shall be of type I species, type II species or other species approved for such use by the building official.

a. Type I species shall include southern yellow pine, oak, Douglas fir and other woods of similar strength and physical characteristics.

b. Type II species shall include Norway pine, spruce and other woods of similar strength and physical characteristics.

**740.2. Quality Requirements.**—The quality of all round timber piles shall at least conform to class A and B, round timber piles listed in reference standard RS 7-10.

Round timber piles shall be cut above the ground swell, have a continuous taper from the point of butt measurement to the tip and be free from decay, red heart, or insect attack. All knots and limbs shall be trimmed or smoothly cut flush with the surface of the pile or swell surrounding the knot. A straight line from the center of the butt to the center of the tip shall lie entirely within the body of the pile. The axis of a wood pile shall not deviate from a straight line more than one (1) inch for each ten (10) feet of length. Short crooks shall not deviate more than two and one-half (2-1/2) inches in five (5) feet. Spiral grain shall not exceed one-half (1/2) of a complete twist in any twenty (20) feet of length, unsound or cluster knots are prohibited and splits and shakes are limited.

**740.3. Minimum Dimensions.**

a. Piles shall be of adequate size to resist the applied loads

without having to endure compressive stress parallel with the grain in excess of the following:

1. Six hundred (600) pounds per square inch for type I species of wood or four hundred twenty-five (425) pounds per square inch for type II species of wood on the pile cross section located at the surface of the bearing stratum for piles driven into materials of classes 6 thru 10.
  2. Three hundred sixty (360) pounds per square inch for type I species of wood or two hundred fifty-five (255) pounds per square inch for type II species of wood on the pile cross section at the tips of piles driven to bearing on materials of classes 1 thru 5.
- b. The piles shall measure at least six (6) inches in diameter at the tip and at least ten (10) inches in diameter at the cut-off, with these measurements being taken under the bark.
- c. All piles shall be driven in one (1) piece except as provided in section 746 for composite piles.

**740.4. Cut-Off.**—The tops of all timber piles shall be cut off in a horizontal plane; and if not treated by an approved preservative process, the cut-off shall be below mean low water level or lowest ground water level, and shall be subject to the building official's approval. He may require the owner to install and maintain in good condition at least one (1) ground water observation well within the building, which shall be accessible to the building official.

**740.5. Treated Piles.**—Timber piles pressure treated with creosote or creosote-coal-tar solution, and conforming to the requirements of this section, may be cut off above permanent ground water level when used for the support of buildings not exceeding two (2) stories in height.

**740.5.1. Treatment.**—Creosoted wood piles of southern yellow pine, Douglas fir, red oak or Norway pine shall be creosoted under pressure in accordance with reference standard RS 7-9 to a final net retention of not less than twenty (20) pounds per cubic foot of creosote for piles exposed to sea water and not less than twelve (12) pounds of creosote per cubic foot for piles for other normal exposure. The tops of such piles at cut-off shall be given three (3) coats of hot creosote, followed by a coat of coal-tar pitch; and the cut-off shall be made in sound wood and be encased not less than three (3) inches in the concrete pile cap.

**740.5.2. Certification.**—Before any treated piles are driven, the building official shall be furnished three (3) copies of a certificate of inspection, issued by an approved independent testing laboratory, certifying that the piles were free of decay, were properly peeled and otherwise prepared before treatment; and that the method of treatment, the chemical composition and the amount of retention of the preservative conform to the requirements of this section.

**740.6. Maximum Load on Wood Piles.**—The load on a wood pile shall not exceed the allowable load specified in section 739. For timber piles driven into material of classes 6 through 10 the area at the surface of the bearing stratum shall be used to compute the allowable load.

**740.6.1.** The maximum load on a timber pile shall not exceed thirty-five (35) tons.

**740.7. Precautions in Driving.**—To avoid damage to the pile, the size of the hammer shall be such that the driving energy in foot-pounds per blow shall not exceed numerically the point diameter of the pile in inches multiplied by fifteen hundred (1500). The total driving energy in foot-pounds for six (6) inches of penetration shall for all types of hammers be numerically no greater than the point diameter in inches times thirty-two thousand (32,000) for type I species of wood or times twenty-two thousand (22,000) for type II species of wood. For the last inch of penetration the energy in foot-pounds shall not exceed numerically the point diameter in inches multiplied by six thousand (6,000). In any case driving shall be stopped immediately when abrupt high resistance to penetration is encountered. Any sudden decrease in driving resistance shall be investigated with regard to the possibility of breakage of the pile; and if such sudden decrease in driving resistance cannot be correlated to boring data, and if the pile cannot be removed for inspection, it shall be considered adequate reason for rejection of the pile.

## **SECTION 741.0. PRECAST CONCRETE PILES**

**741.1. Concrete Strength.**—No precast concrete pile shall be driven before the concrete has attained a compressive strength of not less than four thousand (4000) pounds per square inch based on tests of cylinders cast from the same batches and cured under the same conditions as the pile concrete. These

piles shall be so proportioned, cast, cured, handled and driven as to resist without significant cracking the stresses induced by handling and driving as well as by loads.

**741.2. Design.**—The piles shall be designed and reinforced in accordance with the applicable reinforced concrete regulations cited in section 842.0. If for any reason the pile is injured, or the reinforcement is exposed, its use shall be condemned. The lateral reinforcement at both ends of the pile shall be spaced sufficiently close to resist impact stresses due to driving and in no case more than three (3) inches on center. When driven to or into bearing materials of Classes 1 to 5, inclusive, or through materials containing boulders, they shall have metal tips of approved design.

**741.2.1. Dimensions.**—The minimum lateral dimension of a precast concrete pile shall be ten (10) inches.

**741.2.2. Limitation of Load.**—The load on a precast concrete pile shall not exceed the allowable load specified in section 739 nor twenty-five (25) per cent of the twenty-eight (28) day strength of the concrete, but not exceeding twelve hundred (1200) pounds per square inch. For prestressed concrete piles twenty-five (25) per cent of the effective prestress in the concrete after losses shall be deducted from twenty-five (25) per cent of the twenty-eight (28) day strength or twelve hundred (1200) pounds per square inch, whichever is less, in computing the maximum pile load.

**741.3. Protection.**—A minimum covering of two (2) inches of concrete shall be provided over all reinforcements, except that for piles to be exposed to sea water and other severe environments, a three (3) inch protective covering shall be furnished in the zone of such exposure.

**741.4. Minimum Spacing.**—The minimum spacing center-to-center of precast concrete piles shall be two and one-half (2-1/2) times the square root of the cross-sectional area at the butt.

**741.5. Splices.**—Splices shall not be permitted in precast concrete piles.

**741.6. Driving Precautions.**—When driving through extremely soft soil or in pre-drilled or jetted holes, the hammer ram velocity and stroke shall be reduced to avoid critical tensile stresses. If a pile-driving cap is used, it shall fit loosely around the pile top so as not to restrain the pile from rotating.

The top of the pile must be perpendicular to the longitudinal axis of the pile, and the ends of any prestressing or reinforcing

steel shall be cut flush with the top of the pile to prevent direct impact on the steel during driving.

## **SECTION 742.0. CAST-IN-PLACE CONCRETE PILES**

In this section a distinction is made between poured-concrete piles and compacted-concrete piles. A poured-concrete pile is formed by pouring concrete into a driven casing that is permanently installed in the ground. A compacted-concrete pile is formed by placing concrete having zero (0) slump, in small batches, and compacting each batch. All cast-in-place concrete piles shall be so made and placed as to ensure the exclusion of all foreign matter and to secure a well-formed unit of full cross-section. The minimum strength of concrete for cast-in-place piles shall be three thousand (3000) pounds per square inch. While placing the concrete the casing or drive-pipe shall contain not more than three (3) inches of water.

### **742.1. Poured Concrete Piles.**

**742.1.1. Design.**—The shape of the pile may be cylindrical, or conical, or a combination thereof, or it may be a succession of cylinders of equal length, with the change in diameter of adjoining cylinders not exceeding one (1) inch.

**742.1.2. Loading.**—The load on poured-concrete piles shall not exceed the allowable load specified in section 739 nor twenty-five (25) per cent of the twenty-eight (28) day strength of the concrete, but not exceeding eleven hundred (1,100) pounds per square inch, when applied to the cross-sectional area computed on the following bases:

- a. For metal-cased piles driven to and into materials of Classes 1 to 4, inclusive, using the diameter measured one (1) foot above the point, except that when the rock is immediately overlain by a bearing stratum consisting of one (1) or a combination of bearing materials of Classes 5, 6 and 7, using the diameter at the surface of the bearing stratum.
- b. For metal-cased piles, driven through compressible materials, including Classes 11, 12, 13 and 15 and into a bearing stratum consisting of one (1) or a combination of bearing materials of Classes 5 to 10, inclusive, using the diameter at the surface of the bearing stratum.

**742.1.3. Installation.**—Immediately before filling with concrete, the inside of the casing shall be thoroughly cleaned to the

bottom and inspected by lowering a light bulb, or by means of a light beam. To be accepted: (a) the diameter shall not vary more than twenty (20) per cent from the original value, (b) the point of the casing shall not deviate more than ten (10) per cent of the length of the pile from the design alignment, and (c) the casing shall not deviate by more than four (4) per cent of the length of the casing from a straight line connecting the mid-points of the ends of the casing. If the bottom of the casing is out of sight, the shape and alignment of the casing shall be surveyed with a suitable instrument. No load shall be allowed on a pile, the casing of which shows signs of buckling. No casing or drive-pipe shall be filled with concrete until all casings or drive-pipes within a radius of seven (7) feet, or within the heave range, whichever is greater, have been driven to the required resistance.

#### **742.2. Compacted Concrete Piles.**

**742.2.1. Loading.**—The load on compacted concrete piles shall be limited by the provisions of section 739.4.1 except that the circumscribing polygon shall start at the junction of the shaft and the enlarged base, and the bearing area shall be taken at planes six (6) feet or more below said junction; and the allowable load on a compacted concrete pile shall not exceed one hundred forty (140) tons.

**742.2.2. Installation.**—The installation of such piles shall fulfill the following listed requirements:

- a. The drive-pipe used for installing the piles shall be not less than twenty (20) inches outside diameter for piles which have an allowable load of eighty-five (85) tons or greater, and not less than sixteen (16) inches outside diameter for piles which have an allowable load of less than eighty-five (85) tons. For loads less than fifty (50) tons, smaller drive casings may be used subject to the approval of the building official.
- b. The enlarged base of the pile shall be formed on or in bearing materials of Classes 1 to 9, inclusive. The Class 9 material (fine sand) shall have a maximum of six (6) per cent by weight finer than the No. 200 mesh sieve and shall be non-plastic.
- c. The concrete in the base shall have a minimum compressive strength at twenty-eight (28) days of four thousand (4000) pounds per square inch, shall be of zero (0)

slump, and shall be placed in batches not to exceed five (5) cubic feet in volume.

- d. The last batch of concrete shall be driven into the enlarged base with not less than twenty-five (25) blows, each of not less than one hundred and forty thousand (140,000) foot-pounds. For lower allowable loads, the required number of blows on the last batch shall vary in proportion to the allowable load. On the basis of test data, and subject to approval by the building official, the hammer blow energy may be reduced, in which case the number of blows on the last batch shall vary inversely with the energy delivered per blow.
- e. During injection of the last five (5) cubic feet the level of concrete in the drive casing shall be not more than (6) inches above the bottom of the casing.
- f. As the drive-pipe is being withdrawn, not less than two (2) blows of at least forty thousand (40,000) foot-pounds each shall be applied to compact each batch of concrete in an uncased shaft.
- g. An uncased shaft shall not be formed through inorganic clay or inorganic silt unless a hole is made through such soil by a non-displacement method, at least equal to the inside diameter of the drive-pipe unless the individual piles are located more than nine (9) feet apart and outside the heave range. Compacted concrete piles shall have cased shafts when spaced closer than nine (9) feet apart and when installed through inorganic clay or inorganic silt.
- h. An uncased shaft shall not be formed through peat or other organic soils.
- i. The permanent metal casing shall be fastened to the enlarged base in such a manner that the two (2) will not separate. The concrete may be placed in the metal casing in the same manner as for poured-concrete piles. No metal casing shall be filled with concrete until after all piles within a radius of at least nine (9) feet have been driven. The stresses in metal-cased shafts shall not exceed eleven hundred (1,100) pounds per square inch on the concrete and, in addition, nine-thousand five hundred (9,500) pounds per square inch on the steel casing, provided that its wall thickness is at least two-tenths ( $2/10$ )

of an inch. When required by soil conditions allowance shall be made for corrosion as specified in section 738.

**742.2.3. Spacing.**—The center-to-center spacing of piles shall be not less than three (3) times the shaft diameter and not less than three and one-half (3.5) feet.

## **SECTION 743.0. CONCRETE FILLED PIPE PILES**

**743.1. Concrete Strength and Placement.**—Concrete-filled pipe piles may be driven open-end or closed-end. Concrete shall have a minimum compressive strength of three thousand (3000) pounds per square inch at twenty-eight (28) days' age. After driving all pipes within a seven (7) foot radius, or within heave range whichever is greater, and immediately before filling with concrete, the inside of the pipe shall be thoroughly cleaned to the bottom and inspected by lowering a light bulb, or by means of a light beam. To be acceptable: (a) the diameter shall not vary more than twenty (20) per cent from the original value, (b) the point of the pile shall not deviate more than ten (10) per cent of the length of the pile from the design alignment and (c) the pile shall not deviate by more than six (6) per cent of the length of the pile from a straight line connecting the midpoints of the ends of the pile. If the bottom on the pile is out of sight, or cannot be seen because the pile cannot be dewatered, the shape and alignment of the pile shall be surveyed with a suitable instrument. No load shall be allowed on a pile which shows signs of buckling. Concrete shall not be placed through water, except that the building official may approve the use of a properly operated tremie or pumped concrete in still water, providing the pipe is proven to be free of other material.

**743.2. Steel Pipe.**—All steel pipe shall conform to the applicable standards listed in reference standard RS 7-8 for welded and seamless steel pipe and tubes and for hot rolled carbon steel sheets. The yield point used in the design of steel casings shall be that of the fabricated element as determined by test.

**743.3. Design.**—The load on concrete-filled pipe piles shall not exceed the allowable load determined in accordance with section 739.0, nor a load computed on the basis of stress in the concrete at twenty-five (25) per cent of the twenty-eight (28) day strength, but not exceeding eleven hundred (1100) pounds per square inch, and stress in the steel at nine thousand (9000)



pounds per square inch, nor shall the load carried by the steel on this basis exceed one-half (1/2) the total load on the pile.

**743.4. Minimum Thickness.**—The minimum wall thickness of all load-bearing pipe shall be two-tenths (2/10) inches. When required by soil conditions, allowance shall be made for corrosion as specified in section 738.

**743.5. Splices.**—All splices of the steel section shall be welded to one hundred (100) per cent of the strength of the pipe and otherwise shall comply with section 737.7 and shall be designed to insure true alignment of the pipe and uniform transmission of load from one (1) pipe length to another.

## **SECTION 744.0. CONCRETE FILLED PIPE WITH STEEL CORE (DRILLED-IN-CAISSONS)**

**744.1. Construction.**—These units shall consist of a shaft section of concrete-filled pipe extended to and firmly seated in bedrock of classes 1 or 2 with an uncased socket drilled into the bedrock which is filled with cement grout. The steel core shall be centered in the shaft and shall extend through the cement grout to the bottom of the socket.

**744.2. Steel Shell.**—The steel shell shall be seamless or welded steel pipe with a minimum yield point of thirty-three thousand (33,000) pounds per square inch fitted with an approved cutting shoe and structural cap, or with other approved means of transmitting the superstructure load. The minimum diameter for drilled caissons shall be twenty-four (24) inches and minimum shell thickness five-sixteenths (5/16) inches. Steel shall be protected under the conditions specified in section 738. Splices shall be welded to develop one hundred (100) per cent of the strength of the pipe.

**744.3. Concrete Fill.**—The concrete fill of caissons shall be controlled concrete with a minimum compressive strength of four thousand (4000) pounds per square inch at twenty-eight (28) days. It shall be so placed that it shall fill completely the space between the steel core and the pipe. In case the socket cannot be kept free from inflow of water, the pipe shall be filled to its top with clean water before placing the cement grout. The details of the design and the installation, including the cleaning and inspection of the socket, the placement of concrete under water or in the dry, the method of centering the steel

core and all other phases of the work shall be submitted to the building official for approval.

**744.4. Rock Socket.**—A socket, approximately of the inside diameter of the pipe, shall be made in bedrock of Classes 1 or 2 to a depth that will assure load transfer when computed for a bearing on the bottom surface of the socket in accordance with sections 725 and 728 acting together with a bond stress on the perimeter surface of the socket of one hundred (100) pounds per square inch. Before placement of concrete, the socket and pipe shall be thoroughly cleaned and the rock inspected by a competent engineer or geologist satisfactory to the building official. This inspection may be performed by means of an underwater television camera, the position of which is readily controllable to permit thorough inspection of the exposed rock surface in the socket.

**744.5. Steel Core.**—The steel core shall consist of a structural steel member. The mating ends of the sections shall be spliced so to safely withstand the stresses to which they may be subjected. The minimum clearance between structural core and shell shall be two (2) inches. When such cores are installed in more than one (1) length, they shall be assembled to develop the full compressive strength of the section.

**744.6. Driving Precautions.**—The steel shell shall be driven not more than two (2) per cent of the length out of plumb.

**744.7. Spacing.**—The minimum center-to-center spacing shall be not less than two and one-half (2-1/2) times the outside diameter of the steel shell.

**744.8. Allowable Load.**—The load on concrete-filled pipe piles with steel cores shall not exceed the allowable load determined in accordance with the provisions of section 744.4 nor that computed on the basis of eleven hundred (1100) pounds per square inch on the area of the concrete plus nine thousand (9,000) pounds per square inch on the net area of the steel pipe plus sixteen thousand (16,000) pounds per square inch on the area of the steel core.

## **SECTION 745.0. STRUCTURAL STEEL PILES**

**745.1. Steel.**—Steel sections may be of any type of steel permitted by the provisions of reference standard RS 8-42.

- a. Rolled structural steel piles shall be of H form, with flange projection not exceeding fourteen (14) times the

minimum thickness of metal in either flange or web and with total flange width at least eighty-five (85) per cent of the depth of the section. No section shall have a nominal thickness of metal less than four-tenths (.4) inch nor a nominal depth in the direction of the web of less than eight (8) inches.

- b. The use of built-up sections or sections of other than "H" form will be permitted if the several components of the section are adequately connected to develop the strength of the adjacent components and if the ratio of width to thickness of the component parts does not exceed the values for conventional "H" sections.
- c. The tips of all steel H piles having a thickness of metal less than five-tenths (0.5) inches which are driven to end bearing on rock of class 1 through 3 by an impact hammer, shall be reinforced. The installation of all steel H piles by impact hammer to end bearing on rock of classes 1 through 3 shall be conducted so as to terminate driving directly when the pile reaches refusal on the rock surface.
- d. Structural caps shall be rigidly attached to the pile section and shall be designed to transfer the full load into the piles; except that when the pile extends into the footing sufficiently to develop the full load by bond, or to permit the use of mechanical devices to develop the full load by shear, structural caps shall not be required.

**745.2. Splices.**—If piles are spliced, the splice shall develop one hundred (100) per cent of the strength of the section.

**745.3. Protection.**—Structural steel piles shall be protected under the conditions specified in section 738 or due allowance shall be made for corrosion as therein specified.

**745.4. Allowable Load.**—The load on such piles shall not exceed the allowable load determined in accordance with section 739, nor a load based on stress of eight thousand five hundred (8,500) pounds per square inch on the cross-section.

## **SECTION 746.0. COMPOSITE PILES**

**746.1. Design.**—A composite pile shall consist of a combination of not more than two (2) of any of the different types of piles provided for in this part. The pile shall fulfill the requirements for each type and in addition the provisions of this section.

The requirements of section 742.1.3 shall apply to the entire length of a pipe-shell composite pile.

**746.2. Limitation of Load.**—The allowable load on composite piles shall be that allowed for the weaker of the two (2) sections. For wood-composite piles the allowable load shall not exceed eighty (80) per cent of that allowed for the wood section alone. Wood-shell composite piles shall not be used for support of buildings exceeding two (2) stories in height.

**746.3. Splices.**—The connection between the two (2) types of piles shall be constructed so as to prevent their separation, to maintain their alignment, to support the load, and to be water-tight where concrete must be placed subsequent to the driving.

**746.4. Spacing.**—The center-to-center spacing shall be governed by the larger of the spacings, required in this part, for the types composing the pile.

## **SECTION 747.0. SPECIAL PILES AND CAISSONS**

Types of piles or caissons not specifically covered by the provisions of this code may be permitted provided sufficient test data, design and construction information are filed for the approval of the building official.

## **SECTION 748.0. LATERAL SUPPORT**

**748.1. Surrounding Materials.**—Any soil other than water or fluid soil shall be deemed to afford continuous lateral support to any type of pile or pier. When piles are driven through soil which will be removed subsequent to the completion of the foundation, the resistance offered by such material shall not be considered to contribute to the lateral supporting capacity.

**748.2. Lack of Support.**—The portion of a pile or pier that is not laterally supported shall be designed as a column in accordance with section 842 taking into consideration the end fixity conditions.

## SECTION 749.0. FOUNDATION PIERS

A foundation pier is here defined as a structural member which extends to a satisfactory bearing material, and which may be constructed in an excavation that afterwards is backfilled by an approved method, or by filling the excavation with concrete, or which may be built by sinking an open or pneumatic caisson.

**749.1. Manner of Construction.**—The manner of construction shall be by non-displacement methods and shall permit inspection of the bearing material in place.

**749.2. Base Enlargement.**—The bases of foundation piers may be enlarged by spread footings, pedestals or belled bottoms.

**749.2.1. Belled Bases.**—Bell-shaped bases shall have a minimum edge thickness of four (4) inches. The bell roof shall slope not less than sixty (60) degrees with the horizontal unless the base is designed in accordance with sections 841 or 842.

**749.3. Design of Piers.**—Foundation piers may be designed as concrete columns with continuous lateral support. The unit compressive stress in the concrete at the least cross section shall not exceed twenty-five (25) per cent of the twenty-eight (28) day strength of the concrete nor eleven hundred (1100) pounds per square inch.

**749.3.1.**—When the center of cross section of a foundation pier at any level deviates from the resultant of all forces more than one sixtieth ( $1/60$ ) of its height or more than one tenth ( $1/10$ ) of its diameter, it shall be reinforced as provided in section 842. The restraining effect of the surrounding soil may be taken into account.

**749.4. Placement.**—With approval of the building official, concrete may be placed through still water by means of a properly operated tremie or pumped concrete.

**749.5. Inspection.**—The owner shall engage a competent inspector, qualified by experience and training and satisfactory to the building official, to be present at all times while foundation piers are being installed, to inspect and approve the bearing soil and the placing of the concrete. The inspector shall make a record of the type of bearing soil upon which the pier rests, of the dimensions of the pier, and of the class of concrete used in its construction. A copy of these records shall be filed in the office of the building official.



## REFERENCE STANDARD RS 7

### List of Reference Standards

- RS 7      AASHO                      1965  
Standard Specifications for Highway Bridges
- AREA                      1969  
Specifications for Steel Railway Bridges
- ASCE    Paper No. 3269    1961  
Wind Forces on Structures—1961 Transactions of  
the American Society of Civil Engineers, Vol. 126,  
Part II
- ASTM    A252      1969  
Specification for Welded and Seamless Steel Pipe Piles
- ASTM    D25      1958  
Standard Specification for Round Timber Piles
- AWPA    C1        1968  
Standard for the Preservative Treatment of all Timber  
Products by Pressure Processes
- AWPA    C3        1969  
Standard for the Preservative Treatment of Piles by  
Pressure Processes
- AWPA    M2       1967  
Standard for Inspection of Treated Timber Products
- AWPA    M4       1962  
Standard for the Care of Pressure-Treated Wood  
Products
- ICBO                      1967  
Uniform Building Code, Vol. I, section 2314
- Dead Load Requirements

## Minimum Requirements for Uniformly Distributed and Concentrated Live Loads

## Minimum Wind Pressures for Height and Area Locations

## Required Nominal Thickness of Glass

### RS 7-1 Dead Load Requirements

Categories	PSF
Walls and Partitions (Unplastered)	
Clay Brick (per inch thickness)	
High absorbtion	8.5
Medium absorbtion	10.0
Low absorbtion	11.5
Concrete Brick (per inch thickness)	
Lightweight aggregate	8.5
Heavyweight aggregate	11.5
Sand Lime Brick (per inch thickness)	9.5
Solid Concrete Block (per inch thickness)	
Lightweight aggregate	6.5
Heavyweight aggregate	9.0
Hollow Concrete Block (per inch thickness)	
Lightweight aggregate	5.0
Heavyweight	7.0
Solid Gypsum Block (per inch thickness)	6.0
Hollow Gypsum Block (per inch thickness)	3.5
Facing Tile (per inch thickness)	7.0
Glass Block (per inch thickness)	5.0
Clay Tile (per inch thickness)	
Load bearing	6.0
Non-load bearing	5.0
Split Terra Cotta Furring Tile (per inch thickness)	5.5
Wood Stud (2 inch x 4 inch) Unplastered	4.0
Combination Walls	
8 inch brick and clay tile	60
12 inch brick and clay tile	80
8 inch brick and concrete block	72
12 inch brick and concrete block	90



## Categories

PSF

Walls and Partitions (Plastered)	
Plaster work (to be added to values obtained for unplastered walls above)	
Gypsum (one side)	5
Cement (one side)	10
Gypsum on wood lath	8
Gypsum on metal lath	8
Gypsum on plaster board or fiber board	8
Cement on wood lath	10
Cement on metal lath	10
Gypsum, with sand aggregate, per inch	8.5
Gypsum, with lightweight aggregate, per inch	4
Gypsum, with wood fibers, per inch	6.5
Cement, with sand aggregate, per inch	10
Cement with lightweight aggregate, per inch	5
Lath and Plaster Partitions	
2 inch solid cement on metal lath	25
2 inch solid gypsum on metal lath	18
2 inch solid gypsum on gypsum lath	18
2 inch metal studs gypsum & metal lath both sides	18
3 inch metal studs gypsum & metal lath both sides	19
4 inch metal studs gypsum & metal lath both sides	20
4 inch wood studs plaster one side	12
4 inch wood studs plaster both sides	20
6 inch wood studs plaster & wood lath both sides	18
6 inch wood studs plaster & metal lath both sides	18
6 inch wood studs plaster & plaster boards, both sides	18
6 inch wood studs unplastered gypsum board both sides (dry wall)	10
Ceilings	
Plaster on tile or concrete	5
Suspended metal lath & gypsum plaster	10
Suspended metal lath & cement plaster	12

Categories	PSF
Plaster on wood lath	8
Suspended acoustical tile	2
Plaster board, unplastered	3
Plaster, 3/4 inch, and metal lath	8
<b>Floor Finishes</b>	
Resilient flooring (asphalt tile, linoleum, etc.)	2
Asphalt block, 2 inch	24
Wood block, 3 inch	10
Hardwood flooring, per inch	4
Softwood subflooring, per inch	3
Plywood subflooring, per inch	3
Ceramic or quarry tile, 1 inch	12
Terrazzo, 1 inch	12
Slate, 1 inch	15
Cement, 1 inch	12
Solid flat tile on 1 inch mortar base	23
Cinder finish, per inch thick	12
Gypsum slab, per inch thick	5
<b>Floor Fill</b>	
Cinder concrete, per inch thick	9
Cinder no cement, per inch thick	5
Sand per inch	8
Stone concrete, per inch thick	12
<b>Roof and Wall Coverings</b>	
Clay tile (with mortar)	30
Clay tile (without mortar)	20
3-ply roofing and gravel	6
4-ply roofing and gravel	7
5-ply roofing and gravel	8
Aluminum, tin, or copper sheet	1
<b>Insulation</b>	
Fiberglass per inch	1.5
Foam glass per inch	0.8
Urethane 1 inch	1.0
Urethane 2 inch	1.2
Cork per inch	1.0
Vegetable fiber boards per inch	1.5
Bats and blankets per inch	0.5
Fiberboard, per inch	1.5
Gypsum sheathing, per inch	4.0
Wood sheathing, per inch	3.0

Categories	PSF
Wood shingles, in place	3.0
Asphalt shingles, in place	6
Asbestos-cement shingles, in place	4
Cement tile, 3/8 inch in place	16
Stucco (cement) per inch	10
Slate, 3/16 inch, in place	7
Slate, 1/4 inch, in place	10
Skylight, metal frame, 3/8 inch wire glass	10
Corrugated iron	2
Corrugated metal	2
Formed steel decking	3
Glass	
Single strength	1.2
Double strength	1.6
Plate, wired or structured 1/8 inch	1.6
Insulating double 1/8 inch plates with air space	3.5
Insulating double 1/4 inch plates with air space	7.1
Miscellaneous Materials	<b>PCF</b>
Cast stone masonry (cement stone sand)	144
Masonry ashlar	
Granite	165
Limestone, crystalline	165
Limestone, oolitic	135
Marble ashlar	173
Sandstone ashlar	144
Masonry brick	
Hard (low absorbtion)	140
Medium (medium absorbtion)	120
Soft (high absorbtion)	100
Masonry rubble mortar	
Limestone crystalline	147
Limestone oolitic	138
Granite	153
Masonry dry rubble	
Granite	130
Limestone (oolitic)	125
Marble	130
Sandstone (bluestone)	110

<b>Categories</b>	<b>PSF</b>
Rubble stone masonry	156
Terra cotta architectural (filled)	120
Terra cotta architectural (unfilled)	72
Concrete, stone (plain)	144
Concrete, stone (reinforced)	150
Concrete, cinder	108
Fill, cinder	57
Earth (dry)	100
Earth (wet)	120
Cork (compressed)	14
Timber, ash	45
Timber, Douglas Fir	35
Timber, Cypress	35
Timber, hemlock	35
Timber, oak	45
Southern pine, short leaf	35
Southern pine, long leaf	35
Redwood	35
Spruce	35
Elm	45
Excavated earth	120
Quarried Stone	100
<b>Bituminous Substances</b>	
Coal, anthracite	97
Coal, bituminous	84
Coal, lignite	78
Coal, charcoal	33
Coal, coke	75
Graphite	131
Paraffine	56
Petroleum	54
Petroleum, gasoline	42
Tar, bituminous	75
Steel	490
Iron	450
Water	62.5
<b>Partition Loads</b>	

## Equivalent Uniform Partition Loads

Partition Weight (plf)	Equivalent Uniform Load (psf) (To be added to floor dead and live loads)
50 or less	0
51 to 100	6
101 to 200	12
201 to 350	20
Greater than 350	20 plus a concentrated live load of the weight in excess of 350 plf

## RS 7-2 Minimum Requirements for Uniformly Distributed and Concentrated Live Loads

### Table A — Uniformly Distributed Live Loads

<u>Occupancy or Use</u>	<u>Live Load (PSF)</u>
Armories and Drill Spaces	150
Assembly Spaces:	
Assembly Halls	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">}</div> <div> <p>a) Fixed seating                   a) 60— See note a</p> <p>b) Movable seating               b) 100</p> <p>c) Other —See note b</p> </div> </div>
Auditoriums	
Churches	
Court Rooms	
Dance Halls	
Exhibition Halls	
Galleries	
Gymnasiums	
Lecture Halls	
Lodge Rooms	
Mess Halls	
Museums	
Passenger Stations	
Restaurants	
Alleys (See Driveways and Yards)	
Apartments (See Residential Areas)	
Bakery	150
Balconies	
Exterior	100
Interior and Mezzanines	As required by use
Bowling Alleys (See Recreational Areas)	
Catwalks	40
Class Rooms (See Schools)	
Cornices	75

## Table A — Uniformly Distributed Live Loads

<u>Occupancy or Use</u>	<u>Live Loads (PSF)</u>
Corridors	
In schools (See Schools)	
First floor all areas or uses,	100
Upper Floors (Same as that required for the occupancy of the area being served, or as noted herein)	
Court Rooms (See Assembly Spaces)	
Dance Halls (See Assembly Spaces)	
Dormitories (See Residential Areas)	
Dwellings (See Residential Areas)	
Driveways and Yards	
Pedestrian	100
Vehicular	250
Elevator Machine Rooms	100
Equipment Rooms (Mechanical and Electrical Equipment)	75
Exhibition Rooms (See Assembly Spaces)	
Exitways	100
Fire Escapes	100
Garages	
Passenger Cars	75
Trucks — Load 3 to 10 tons (Buses)	
Columns	120
Beams	120
Girders	120
Floor Slab	175
Trucks — Load more than 10 tons (Buses)	250
Note: Design considerations for garages must also include concentrated load requirement of Table B, and member selection is to be based on resultant maximum stress condition.	
Grandstands, Reviewing Stands and Bleachers	100
Hospitals	
Operating Rooms, Laboratories and Service Areas	60
Private Rooms, Wards, and Personnel Areas	40
X-Ray, Therapy and Similar Uses	75
Others (As Required by Use)	
Hotels (See Residential Areas)	
Ice Skating Rinks	
Playing surface	250
Others (As Required by Use)	
Libraries	
Reading and Study Rooms	60
Stack Rooms	150 (c)
Others (As Required by Use)	
Lobbies and Similar Areas (All Buildings)	100
Locker Rooms	75
Loft Buildings	125
Laboratories (Scientific)	100
Laundries	150
Manufacturing	
Light	100
Heavy (Minimum as listed, but not less than actual loads)	250

**Table A — Uniformly Distributed Live Loads**

<u>Occupancy or Use</u>	<u>Live Loads (PSF)</u>
Repair Areas	100
Museums (See Assembly Spaces)	
Marquees	75
Office Buildings	
Office Rooms	50
Letter File Rooms	80
Card File Rooms	125
Open Parking Structures (See Garages)	
Penal Institutions, Reformatories, Jails	
Homes of Correction	
Cell Blocks	40
Corridors	100
Plaza Areas (Open) accessible to the public (including landscaped portions)	100
Public Dining Rooms (See Assembly Spaces)	
Printing Plants	
Press Rooms	150
Paper Storage (50 lb. per ft. of clear story height)	
Others	100
Passenger Stations (See Assembly Spaces)	
Recreational Areas	
Bowling Alleys	
Playing surface (excludes weight of machinery, but includes construction of alleys)	75
Concourse	100
Others (As Required by Occupancy or Use)	
Pool Rooms and Similar	75
Residential Areas	
Apartments, Hotels, Motels, Tenements, Guest Rooms, Living Areas, and Private Corridors	40
First Floor Corridors, Public Spaces and Corridors serving public spaces	100
Public Corridors at Upper Floors	60
Dormitories	
Partitioned Living Areas	40
Non-partitioned Living Areas	60
First Floor corridors, public spaces and corridors serving public spaces	100
Public Corridors at Upper Floors	60
Dwellings	
Multi-family units (Same requirements as those for Apartments above)	
One and two family units	
First floor	40
Upper floors and habitable attics	30
Uninhabitable attics	20 (b)
Rest Rooms	
Serving places of Assembly	100
Others	50
Restaurants (See Assembly Spaces)	
Roller Skating Rinks	
Skating surface	100
Others (As Required by Occupancy or Use)	

**Table A — Uniformly Distributed Live Loads**

<u>Occupancy or Use</u>	<u>Live Loads (PSF)</u>
Sidewalks	250
Schools	
Classrooms	50
Fixed seats	60
Movable seats	100
Corridors	100
Shops	
Automotive and Press	100
Others	60
Others (As Required by Occupancy or Use of the Area)	
Stairs	100
Storage	
Light	125
Heavy	250
Hay or Grain	300
Warehouse	150
Cold	
No overhead system (250 psf plus 150 psf for trucks)	
With overhead system	
Floor	150
Roof	250
Stores and Shops	
Banking Rooms	100
Retail Sales	
Heavy — all floors	125
Light — all floors	100
Wholesale Sales	100
Telephone Equipment Rooms	80
Theaters	
Balconies (As Required by Occupancy or Use)	
Dressing Rooms	40
Lobbies, Corridors, Aisles	100
Orchestra Floors	60
Projection Rooms	100
Standing Space	100
Stage Floor	150

Notes:

a. Uniform load shall be applied to the gross floor area.

b. Live load need be applied to joists or to bottom chords of trusses or trussed rafters only in those portions of attic space having a clear height of 42 in. or more between joist and rafter in conventional rafter construction; and between bottom chord and any other member in trussed or trussed rafter construction. However, joists or the bottom chords of trusses or trussed rafters shall be designed to sustain the imposed dead load or using the formula 1000 net floor area per occupant, but shall not be less than 50 psf nor 10 psi, whichever is greater, uniformly distributed over the entire span.

c. Minimum of 150 but not less than actual.



Table B—Concentrated Live Loads

<u>Use or Location</u>	<u>Load (lbs.)<sup>a</sup></u>	<u>Remarks</u>
Elevator machine room floor		See Reference Standard RS 16
Gratings, checkered plates and similar metal decks	200 (on area of 1.0 sq. in.)	Nonconcurrent with uniform live load
Floor registers and similar floor insets	250 (on area of 2 ft. x 2 ft.)	Nonconcurrent with uniform live load
Garages		
Passenger vehicles	2,500 (on area of 20 sq. in) For slab or deck design	The concentrated load may be assumed to represent the reaction of a jack placed under one end of the vehicle. Omit uniform live load in area (6 ft. x 9 ft.) representing one half the vehicle, adjacent to the point of load concentration.
	1,500 (each wheel)	To be used in lieu of uniform live load in stalls of mechanized garages where there is no slab or deck.
Trucks, buses	150 per cent of maximum wheel load with vehicle loaded (on area of 20 sq. in.)	Same as for Garages—Passenger Vehicles
Floor of office areas	2,000	Nonconcurrent with uniform live load
Resident and multiple dwellings	200 (on area of 4.0 sq. in.)	Nonconcurrent with uniform live load
Scuttles and skylight ribs	200	Nonconcurrent with uniform live load
Steel joists—for each individual joist	800 (for trussed joists apply at a panel point)	Nonconcurrent with uniform live load
Roofs	250 (on area of 2 ft. x 2 ft.)	Nonconcurrent with uniform live load. Not applicable, for awnings, canopies, and similar constructions where access by persons is difficult and not intended.

## Table B—Concentrated Live Loads

Use or Location	Load(lbs.) <sup>a</sup>	Remarks
Stair and fire escape treads	300 (on area 1 ft. wide by depth of the tread and spaced at 3 ft. center-to-center)	Nonconcurrent with uniform live load
Boiler rooms	3,000	The concentrated load of 3,000 lbs. may be assumed to represent the weight of minor items of equipment (pumps, etc.) in temporary locations during installation. In addition provision shall be made for supporting the weight of the empty boiler at pertinent locations on the floor to provide for replacement of the boiler.

Note a: Except when otherwise indicated loads are assumed to be applied over an area 2-1/2 ft. x 2-1/2 ft.

RS 7-3      AASHO                      1965  
Standard Specifications for Highway Bridges

RS 7-4      AREA                              1969  
Specifications for Steel Railway Bridges

**RS 7-5 Table of Minimum Wind Pressures for Height and Area Locations**

Height in Feet	P in lbs. per sq. ft.		
	A	B	C
0 to less than 25	20	20	20
25 to less than 50	25	25	20
50 to less than 100	30	25	20
100 to less than 150	35	30	20
150 to less than 200	45	30	20
200 to less than 300	45	35	25
300 to less than 400	45	40	30
400 to less than 500	55	45	35
500 to less than 600	55	50	40
600 to less than 700	55	55	45
700 to less than 800	65	60	50
800 to less than 900	65	65	55
900 to less than 1000	65	65	60
1000 and over	in accordance with sound engineering principles approved by the building official		

- A. are the values of P for a structure on islands in Boston Harbor (including former islands now having causeways thereto).
- B. are the values of P for a structure any part of which lies within 800 feet of mean low water line (as determined by mean low water at U. S. Navy Yard at Charlestown).
- C. are the values of P for every other structure.

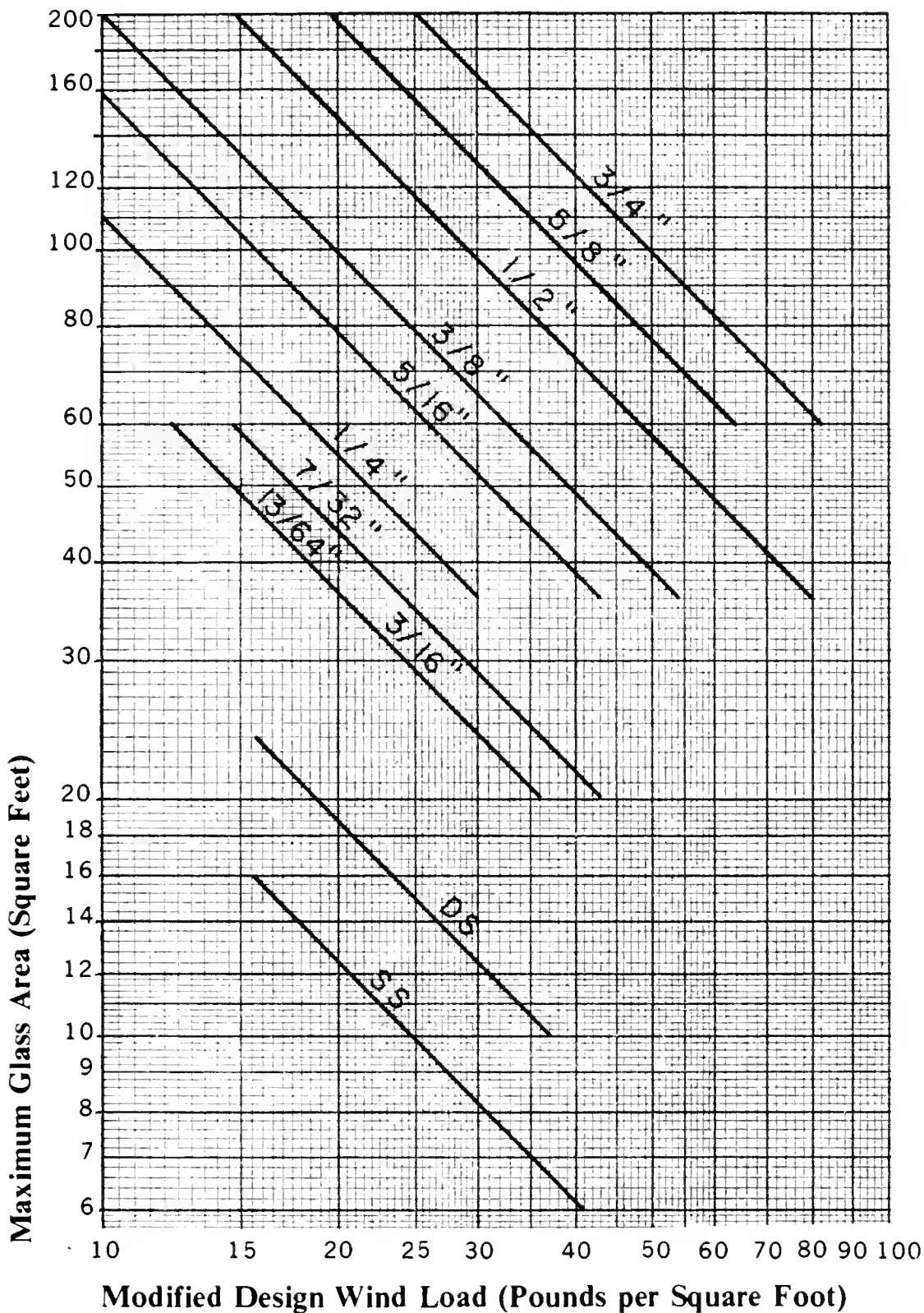
**RS 7-6 Required Nominal Thickness of Glass**

The required nominal thickness of glass shall be determined from the chart within this reference standard. The modified design wind load to be used as the abscissa for entering this chart shall be determined by dividing the appropriate general design wind load

from section 713 by the relative resistance value for the glass type involved. For this purpose the relative resistances to wind load for equal thicknesses of glass shall be assumed as follows:

<b>Glass Type</b>	<b>Relative Resistance</b>
Regular Plate or Sheet .....	1.0
Laminated .....	0.6
Wired Glass .....	0.5
Heat Strengthened .....	2.0
Fully-Tempered .....	4.0
Rough-Rolled Plate .....	1.0
Sandblasted .....	0.4
Factory Fabricated Double Glazing (Use only the thickness of the thinner of the two lights) .....	1.5

**Required Nominal Thickness of Glass**



This chart is based on minimum thicknesses allowed in Federal Specification DD-G-451b

Design Factor - 2.5

**RS 7-7**

The allowable working stresses for ordinary materials as defined in sections 701 and 722 shall be reduced below the allowable values specified in Article 8 by the amounts listed below. When the structural material is identified in regard to manufacture and grade and the identification is accompanied by satisfactory mill tests or the strength and stress grade of the materials are otherwise confirmed to the satisfaction of the building official, the allowable working stresses may be increased to comply with the provisions of Article 8.

**10% Reduction**

Reinforced Concrete Stresses .....	Section 842
Reinforced Gypsum Concrete Stresses .	Section 850
Steel Reinforcement Stresses .....	Section 830
Structural Steel Stresses .....	Section 827
Open-Web Steel Joist Stresses .....	Section 829
Formed Steel Construction Stresses ....	Section 828
Stresses for all materials not otherwise noted in this reference standard	

**25% Reduction**

Cast Steel Stresses .....	Section 831
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**RS 7-8**    ASTM    A252    1969  
Specification for Welded and Seamless Steel Pipe Piles

**RS 7-9**    AWPA    C1    1968  
Standard for the Preservative Treatment of all Timber Products by Pressure Processes

AWPA    C3    1969  
Standard for the Preservative Treatment of Piles by Pressure Processes

AWPA    M4    1962  
Standard for the Case of Pressure-Treated Wood Products

AWPA    M2    1967  
Standard for Inspection of Treated Timber Products

- RS 7-10** ASTM D25 1958  
Standard Specification for Round Timber Piles
- RS 7-11** ASCE Paper No. 3269 1961  
Wind Forces On Structures—1961 Transactions of  
The American Society of Civil Engineers, Vol. 126,  
Part II
- RS 7-12** ICBO 1967  
Uniform Building Code, Vol. I, Section 2314, “Earth-  
quake Regulations”





**MATERIALS AND TESTS**

800.0	Scope	813.0	Architectural Terra Cotta
801.0	Definitions	814.0	Natural Stone
802.0	Basic Classification of Construction Materials	815.0	Cast Stone
803.0	Tests	816.0	Mortar and Grout for Masonry
804.0	Conditions of Acceptance	817.0	Concrete Aggregates
805.0	Approvals	818.0	Ready-Mix Concrete
806.0	Masonry Construction Units	819.0	Structural Wood Glues
807.0	Brick Units	820.0	Interior Lathing and Plastering
808.0	Structural Clay Tile Units	821.0	Exterior Lathing and Stucco
809.0	Glazed Masonry Units	822.0	Plastering Materials
810.0	Concrete Units	823.0	Plaster Bases
811.0	Gypsum Units	824.0	Fiber Boards
812.0	Structural Glass Block Units	825.0	Plywood
		826.0	Wall Boards and Sheathing

**TABLE**

8-1 816.2.1. Mortar Proportions (Parts by Volume)

**SECTION 800.0. SCOPE**

The provisions of this article shall govern the quality, workmanship and requirements for all materials and methods and the minimum specifications for enclosure walls and wall thickness hereafter used in the construction of buildings and structures. All materials and methods of construction shall conform to the approved rules, the standards for materials and tests of approved authoritative agencies, the requirements of accepted engineering practice and the certification requirements of reference standard RS 8-60 as herein specified.

**800.1. Accepted Engineering Practice.**—The quality, use and installation of all materials and methods of building construction shall be controlled by the standards of accepted engineering practice as listed in reference standard RS 8, except where otherwise specifically provided in this code.

**800.2. Material Standards.**—All building units used in wall, partition and floor construction and for fireproofing or other insulation purposes shall comply with the applicable standards listed in reference standard RS 8.

**800.3. New Materials.**—All new building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed

for use in the construction of a building or structure, shall be subjected to the tests prescribed in this Code and in the approved rules to determine its character, quality and limitations of use.

**800.4. Used Materials.**—The use of all second-hand materials which meet the minimum requirements of this code for new materials shall be permitted.

**800.5. Alternate Test Procedure.**—In the absence of approved rules or other accepted standards, the building official shall make or cause to be made the necessary tests and investigations, or he may accept duly authenticated reports from recognized testing authorities in respect to the quality and manner of use of new materials as provided in section 116. The cost of all tests and other investigations required under the provisions of this code shall be borne by the applicant.

## **SECTION 801.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.0.

## **SECTION 802.0. BASIC CLASSIFICATION OF CONSTRUCTION MATERIALS**

All materials and methods used in the design and construction of buildings and structures shall be classified as controlled materials or ordinary materials as defined in sections 201 and 722. The design procedures and construction shall be based on the assumptions, limitations and methods of stress determination of the specified reference standards.

## **SECTION 803.0. TESTS**

All structural units and assemblies unless approved or otherwise provided for in this code shall be tested in accordance with the appropriate Reference Standard specified in this Code for the particular unit or assembly. Also, the building official may require reasonable tests from time to time similarly conducted to determine quality or conformance with the provisions of this Code. In the absence of test procedures governing any specific material or method of construction, the building official shall either accept authenticated reports from approved recog-

nized authoritative sources which meet the requirements of this code or shall specify the method and manner of making the test.

**803.1. Strength Tests.**—To determine the safe uniformly distributed working load, when not capable of design by accepted engineering analysis, or to check the adequacy of the structural design of an assembly when there is reasonable doubt as to its strength or stability, every system of construction, sub-assembly or assembled unit and its connections shall be subjected to strength tests prescribed in this code, or to such other tests acceptable to the building official that simulate the loads and conditions of application that the completed structure will be subjected to in normal use. Structural load determinations shall include but not be limited to consideration of transverse floor and roof loading, wall compression and racking, concentrated loads, plaster bond as affected by deflections, puncture penetration of materials and assemblies as specified in section 804.6, and soil tests.

**803.1.1. Strength Tests for Glass.**—The working strength of glass for any location in which it is required to withstand specific loads shall be determined as provided in reference standard RS 7-6.

**803.2. Durability and Endurance Tests.**—Whenever required by the building official or specified herein or in the approved rules, the material or construction shall be subjected to approved testing procedures to determine resistance to fatigue, durability, and weather resistance. These procedures may include subjecting the material or construction to sustained and repetitive loading as a measure of its resistance to fatigue.

**803.3. Maintenance Test.**—In addition to durability and endurance tests, tests of all materials shall be made to assure the maintenance of the standards of approved materials when reasonable doubt exists as to quality and when required by the building official.

**803.4. Workmanship Test.**—Whenever there is reasonable doubt as to the stability or structural safety of a completed building or structure or part thereof for the intended occupancy, the building official may require a load test of the building unit or portion of the structure in question. Such existing structure shall be subjected to its own dead load plus a superimposed load equal to one-half (0.5) times the dead load plus one and eight-tenths (1.8) times the live load (applied test load equals  $0.5D + 1.8L$ ),

or to a load causing a stress equal to eighty (80) per cent of the yield point of the constituent materials whichever is less. The test load shall be left in place for a period of twenty-four (24) hours. If during the test, or upon removal of the test load, the structure shows evidence of failure, the building official shall order such reinforcement or modifications deemed necessary to insure adequacy of the structure for the rated capacity; or in lieu thereof, he may specify a reduced working load to which the structure shall be limited. The structure shall be considered to have successfully met the test requirements if the total deflection does not exceed the theoretical deflection computed by accepted engineering formulae. When the total deflection is greater than such theoretical value, the structure shall be considered safe for the design load, if it recovers seventy-five (75) percent of the maximum deflection within twenty-four (24) hours after removal of the test load. This provision shall in no way relieve compliance with the maximum permissible deflection limitations under working loads allowed by this code.

**803.5. Tests of Service Equipment and Devices.**—Tests of service equipment and accessories shall include proscenium curtain and stage ventilation, article 4; structural load tests, article 7; flues and chimneys, article 10; boilers, article 11; sprinkler and standpipe equipment, article 12; electric installations, article 15; moving stairways, elevator interlocks and safety devices, article 16; refrigerating equipment, article 18; plumbing systems and devices as required by article 17 and all other service tests required by the approved rules.

**803.6. Fire Tests.**—In the determination of flash points, combustibility, flameresistance and fireresistance of construction materials and methods, all tests shall be conducted in conformity to sections 903 and 904.

**803.7. Prefabricated Construction Tests.**—Prefabricated assemblies or sub-assemblies not capable of design by accepted engineering analysis, shall meet all the requirements and tests for at-site construction. The floor panels and other prefabricated units shall be assembled to form an integrated test specimen constructed as in practice, of not less than three (3) units in width with two (2) longitudinal joints; and when designed on the assumption of a simple span, such units shall be tested with flat end supports.

**803.8. Test Specimens.**—The selection and construction of all test specimens and the details of test procedure herein required

shall conform to the recognized test procedures listed in the reference standards. All test specimens and constructions shall be truly representative of the materials, workmanship and details to be normally applied in practice. When structural or fire-resistive properties of the material are dependent upon adequate curing, the age of the concrete compression test specimens shall be not less than seven (7) nor more than twenty-eight (28) days and as required by reference standard RS 9-2 for fire-resistive properties, unless otherwise approved by the building official.

**803.9. Conditions of Support and Loading Interaction.**—Load tests shall be performed in such a manner that the supports for the members or assemblies being tested will simulate the conditions of support in the building, except that conditions of partial fixity may be approximated by condition of full or zero restraint, whichever produces a more severe stress condition in the member being tested. The test conditions shall be such as to obviate all interaction of fills, finishes, partitions, supports, or members whose interaction normally would be neglected in design. Where continuous, multiple, intersecting, or connected members are used in the test, all interacting members shall be simultaneously and fully loaded and additional tests shall be performed under partial live loading as necessary to produce maximum stresses.

## **SECTION 804.0. CONDITIONS OF ACCEPTANCE**

Where, because of practical difficulties, design calculations for the strength or deflection characteristics of a member or assembly cannot be executed, its evaluation may be based on load tests performed and evaluated in accordance with the requirements of this article. These provisions shall apply only to load tests made to assist in establishing the structural adequacy of members or assemblies before their incorporation into the structure. Load tests to establish the adequacy of construction already in place shall conform to the requirements of section 803.4.

### **804.1. Test Load Factor.**

- a. The test specimen shall sustain for a period of twenty-four (24) hours, without visible damage other than hair-line cracks, its own weight, plus a superimposed test load equal to the dead load to be added at the site

plus one hundred fifty (150) percent of the design live load.

- b. After completion of the test required by section 804.1.a. and removal of all superimposed loads, the recovery of deflection within twenty-four (24) hours shall be at least seventy-five (75) percent of the deflection due to the superimposed loads.
- c. The test specimen shall sustain without collapse its own weight, plus a superimposed test load equal to fifty (50) percent of its weight plus one hundred fifty (150) percent of the dead load to be added at the site, plus two hundred fifty (250) percent of the design live load.

**804.2. Working Load Deflection.**—The deflection properties of the member or assembly under working loads shall conform to the applicable requirements of this Code and the reference standards, as well as to any special requirements of the job specifications. Such deflections may be predicted on the basis of short-time tests, plus a suitable allowance, approved by the building official, for the effects of shrinkage and creep.

**804.3. Wall and Partition Assemblies.**—Bearing wall and partition assemblies shall sustain the load test both with and without window framing.

**804.4. Comparative Tests.**—When not available from existing authoritative test data, the building official may require comparative tests of assemblies of standard traditional forms of construction used for similar purposes to assist in determining the adequacy of the new construction.

**804.5. Concentrated Load Tests.**—When not capable of design all floor construction in the occupancy or use classification groups specified in reference standard RS 7-2, Table B shall be subjected to the concentrated loads therein prescribed when such loading causes stresses greater than the uniformly distributed load specified for such occupancies or uses in reference standard RS 7-2 Table A.

**804.6. Puncture Penetration Tests.**—All finish floor constructions in which light gage metal or other thin materials are used as the structural floor shall withstand the application of a two hundred (200) pound concentrated load applied to the top surface on an area of one (1) square inch at any point or points of the construction designated by the building official.

**SECTION 805.0. APPROVALS**

**805.1. Written Approval.**—Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be approved by the building official in writing within a reasonable time after satisfactory completion of all required tests and submission of required test reports.

**805.2. Approval Record.**—Whenever any material, appliance, equipment, system or method of construction shall have been approved by the building official, a record of such approval, including all the conditions and limitations of its permitted use, shall be kept on file in his office and shall be open to public inspection during business hours.

**805.3. Identification of Product.**—When identification of a material is necessary for structural safety, the approved material shall be identified by the approved label and the grade mark, trademark or other manufacturer's identification for which official recognition is desired. A drawing of the identification marks shall be filed with the building official and kept in the official records.

**805.4. Heretofore Approved Materials.**—The use of any material already fabricated or of any construction already erected, which conformed to requirements or approvals heretofore in effect, shall be permitted to continue, if not detrimental to life, health or safety of the public.

**SECTION 806.0. MASONRY CONSTRUCTION UNITS**

The quality of materials assembled in masonry and the method and manner of their assembly shall be suitable for their use and shall conform to the minimum requirements of reference standard RS 8.

**806.1. Identification.**—The materials entering into masonry shall be classified for the purposes of this code as follows:

- Brick
- Structural Clay Tile
- Glazed Masonry Units
- Concrete Units
- Gypsum Units
- Structural Glass Block Units
- Architectural Terra Cotta
- Natural Stone
- Cast Stone
- Mortar for Masonry

A material of masonry other than those classified in this article, which is incombustible and otherwise sufficiently embodies the characteristics of one of the materials here classified, and which satisfies the requirements of this article for that material may be included by the building official in the classification of that material which is most closely resembles.

**806.2. Nominal Dimensions.**—Dimensions and thicknesses specified herein are nominal dimensions; actual dimensions may vary from the prescribed minimum in accordance with accepted tolerances in the building industry.

**806.3. Second-Hand Units.**—Brick and other second-hand masonry units may be reused subject to the requirements of this code as to quality, condition and compliance with the requirements for new masonry units. The unit shall be good, whole, sound material, free from cracks and other defects that would interfere with its proper laying or use; and shall be cleaned free from old mortar before reuse.

## **SECTION 807.0. BRICK UNITS**

All clay, shale and sand-lime brick shall be selected on the appropriate grade specified by reference standards RS 8-1 and RS 8-2. See Section 810.0 for concrete brick. The minimum grade permitted for brick in contact with the ground and subject to water, frost and freezing action shall be grade SW; when subject to frost without danger of water saturation, grade MW; and when not subject to weathering or when used as back-up in exterior walls or for interior construction, grade NW. Underburned clay brick shall not be used in isolated brick piers, nor in a bearing wall which is more than forty (40) feet in height. Brick for fire protection, fireresistive walls or fire stopping shall be of grade MW or better.

## **SECTION 808.0. STRUCTURAL CLAY TILE UNITS**

Structural clay tile shall consist of well burned hollow units of clay or shale classified for use as load bearing wall tile, floor tile, or fireproofing and non-load bearing partition tile.

**808.1. Load Bearing Wall Tile.**—Structural clay load bearing wall tile shall be classified for physical quality as grade LBX or grade LB and shall be in conformance with reference standard RS 8-4.



**808.2. Floor Tile.**—Structural clay floor tile shall be classified for physical quality as grade FT1 or grade FT2 and shall conform to reference standard RS 8-6.

**808.2.1. Arches.**—Structural clay floor tile used in floor and roof arches shall be at least grade FT2.

**808.3. Fireproofing and Non-Load Bearing Partition Tile.**—Structural clay non-load bearing tile, used for partitions, fireproofing, and furring shall be classified as grade NB and shall conform to reference standard RS 8-5.

**808.3.1. Fireresistance.**—Structural clay tile in fire resistive construction shall be of grade NB or better, and shall conform to the requirements of section 221.1 Table 2-1.

**808.4. Exposure.**—Any structural clay tile exposed to the weather shall be at least of grade LBX.

## **SECTION 809.0. GLAZED MASONRY UNITS**

Structural clay load-bearing facing tile, facing brick, and other solid masonry units made from clay, shale, fire-clay, or mixtures thereof having a finish consisting of a ceramic glaze shall be in conformance with reference standard RS 8-7.

## **SECTION 810.0. CONCRETE UNITS**

Concrete units as classified in this code shall include concrete bricks, solid load bearing units, hollow load bearing units and hollow non-load bearing units of concrete made from Portland cement, water and suitable aggregates, such as sand, gravel, crushed stone, bituminous or anthracite cinders, expanded clay or shale and blast furnace slag. The materials shall conform to the specific reference standards herein noted except that cinder aggregate for concrete blocks shall contain not more than twenty (20) per cent of combustible matter.

**810.1. Quality.**—Cast concrete units shall be of sound, compact structure, uniform in shape and free from cracks, warpage or other defects that would impair their serviceability or strength when laid in the wall.

**810.2. Hollow Load Bearing Units.**—Hollow load bearing concrete units shall conform to reference standard RS 8-8 and when used unprotected below grade or unprotected against the

weather by stucco, brick or other approved facings or veneers shall be grade U; when used protected below grade or protected exterior subject to frost action, grade P or better; for interior and protected exterior use not subject to frost action, grade G or better.

**810.3. Hollow Non-Load Bearing Units.**—Hollow non-load bearing concrete units shall conform to reference standard RS 8-9 and may be used in non-load bearing interior partitions and non-load bearing exterior walls where effectively protected from the weather.

**810.4. Solid Load Bearing Units.**—Solid load bearing units shall conform to reference standard RS 8-10 and when used unprotected below grade or unprotected against the weather by stucco, brick or other approved facings or veneers shall be grade U; when used protected below grade or protected exterior subject to frost action, grade P or better; for interior and protected exterior use not subject to frost action, grade G or better.

**810.5. Concrete Brick.**—Concrete brick shall conform to reference standard RS 8-3 and when exposed to severe frost action shall be grade U; when exposed to moderate frost action shall be grade P or better; and when used in backup or interior masonry, or where effectively protected against moisture penetration, grade G or better.

**810.6. Concrete Fireproofing and Furring Units.**—Concrete units may be used for fireproofing or furring when graded for weathering according to this section except that the exterior use of hollow non-load bearing units shall not be permitted for fireproofing purposes. All non-load bearing units shall be clearly marked to distinguish them from load bearing units.

**810.7. Concrete Floor Tile.**

**810.7.1. Structural Fillers.**—Structural concrete filler-block or tile when included in strength calculations in ribbed floor construction shall have webs and shells not less than one (1) inch thick and shall develop an average compressive strength on the net area not less than that of the rib concrete.

**810.7.2. Other Fillers.**—Removable tile and permanent fillers which are not included in strength calculations shall be of adequate strength to insure integrity of the unit and safety in handling as approved by the building official.

## **SECTION 811.0. GYPSUM UNITS**

A gypsum building unit in the form of tile or block for use in non-loadbearing construction in the interior of buildings and for the protection of columns, elevator shafts, etc., against fire shall conform to reference standard RS 8-11.

**811.1. Use.**—Gypsum tile or block shall not be used in load bearing masonry, in masonry exposed to weather or soil, nor in masonry exposed to frequent or continuous wetting. Gypsum partition tile or block shall not be used for partitions to receive Portland cement plaster, ceramic tile, marble or structural glass wainscots unless self-furring metal lath is placed over the gypsum tile.

## **SECTION 812.0. STRUCTURAL GLASS BLOCK UNITS**

Glass block may be solid or hollow. All mortar bearing surfaces of the block shall be precoated or prepared to insure adhesion between mortar and glass. Glass blocks shall not be used in fire walls, party walls or fire division walls, or for load-bearing construction.

## **SECTION 813.0. ARCHITECTURAL TERRA COTTA**

All approved architectural terra cotta units shall be formed with a strong, homogeneous body of hard-burned, weather-resisting clay which gives off a sharp, metallic ring when struck. All units shall be formed to engage securely with and anchor to the structural frame or masonry wall, and shall conform to reference standards RS 8-4 and RS 8-5.

## **SECTION 814.0. NATURAL STONE**

Natural stone for masonry shall be sound, free from loose or friable inclusions; and shall have the characteristics of strength, durability, fire resistance, and resistance to impact and abrasion commensurate with the proposed use. Sandstone in masonry exposed to the weather shall be laid with its natural bed horizontal.

## **SECTION 815.0. CAST STONE**

**815.1. Description.**—Cast stone shall be precast of Portland

cement, aggregates, and water with or without admixtures, or strength, durability, and fire-resistance commensurate with its proposed use, and in accordance with reference standard RS 8-12.

**815.2. Limitations.** — The intended use for cast stone shall be as a trim, veneer, or facing on a structure with no unit dimension in excess of eighteen (18) inches. Cast stone shall not project more than six (6) inches beyond its supporting material. Cast stone shall have reinforcing as required for reinforced concrete with no less than three (3) inch damp-proofing protection of the reinforcing.

**815.3. Strength.** — The minimum compressive strength of cast stone when delivered to the building site shall be sixty-five hundred (6,500) pounds per square inch when tested as three-inch by three-inch (3'' x 3'') cylinders or two-inch by two-inch (2'' x 2'') cubes.

The average water absorption of cast stone when delivered to the building site shall be not more than six (6) percent by dry weight of the specimens when tested as three-inch by three-inch (3'' x 3'') cylinders or two-inch by two-inch (2'' x 2'') cubes.

**815.4. Exceptions.** — Other precast concrete, whether fabricated at factory or site, not in compliance with the preceding shall be in conformance with section 1912.0.

## **SECTION 816.0. MORTAR AND GROUT FOR MASONRY**

**816.1. Materials.** — All Portland, natural and masonry cements, quicklime and hydrated lime for use in masonry mortar and grout shall meet the minimum strength and durability requirements of reference standards RS 8-13 thru RS 8-17. Masonry shall be laid in mortar, except plain concrete, plain gypsum concrete, stone masonry in underwater masonry, and retaining walls not in buildings which may be laid without mortar.

**816.2. Mortar Types and Proportions.** — Mortar for masonry construction shall conform to one (1) of the following types and shall be mixed to a consistent workability in the specified proportions measured by volume with clean fresh water free from harmful amounts of acids, alkalis, oils or organic materials; and with approved aggregates composed of hard, strong, durable mineral particles well graded from fine to coarse, free from injurious amounts of acids, alkalis, oils, saline, organic and other

deleterious substances. Masonry mortars shall have a flow after suction of not less than seventy (70) percent, and shall conform to reference standard RS 8-18 and the following table:

**816.2.1. Table 8-1  
Mortar Proportions (Parts by Volume)**

Mortar Type	Portland Cement	Masonry Cement Type II	Hydrated Lime or Lime Putty Min.	Max.	Damp Loose Aggregate
M	1	—	—	1/4	
	1	1	—	—	
S	1	—	1/4	1/2	Not less than 2-1/4 and not more than 3 times the sum of the volumes of the cements and lime used.
	1/2	1	—	—	
N	1	—	1/2	1-1/4	
	—	1	—	—	
O	—	1	—	—	
	1	—	1-1/4	2-1/2	

Grout shall conform to reference standard RS 8-19.

**816.2.2. Lime Putty.**—Lime putty shall be made by slaking to a smooth paste fresh and properly burned quicklime. The resultant paste shall be stored in a suitable box or other receptacle for not less than forty-eight (48) hours before being mixed with sand. Hydrated lime may be substituted in equivalent amount for lime putty.

**816.3. Types of Mortar Permitted.**—Unit masonry shall be laid in mortar of the following types:

Type of Masonry	Types of Mortar Permitted
Masonry in contact with earth	M or S
Grouted and filled cell masonry	M or S
Masonry above grade or interior masonry:	
Piers of solid units	M, S or N
Piers of hollow units	M or S
Walls of solid units	M, S or N
Walls of hollow units	M, S or N
Cavity walls and masonry bonded hollow walls:	
Design wind pressure exceeds 20 psf	M or S
Design wind pressure 20 psf or less	M, S or N

Type of Masonry	Types of Mortar Permitted
Glass block masonry	S or N
Nonloadbearing partitions and fire-proofing	M, S, N, O or Gypsum
Gypsum partition tile or block	Gypsum
Fire brick	Refractory air-setting mortar
Linings of existing masonry, above or below grade	M or S
Masonry other than above	M, S or N
NOTE:	Mortar or grout under metal bases of columns or beams resting upon concrete shall be made without lime.

**816.4. Special Mortars.** — The building official may approve other special masonry mortars in place of the mortar types listed in section 816.2, provided they develop the minimum compressive strengths specified for the respective mortars they replace. The strength classification of a special mortar or special mix may be determined by compressive strength tests with the materials and in the proportions representative of those to be used in actual practice. In no case shall the allowable unit working stresses in the masonry be more than one-fourth (1/4) the average ultimate compressive strength of the assembled test samples.

**816.5. Gypsum Mortar.** — Gypsum mortar shall be composed of one (1) part of unfibered calcined neat gypsum to not more than three (3) parts sand by weight. Only gypsum mortar shall be used with gypsum tile and block units. Gypsum shall conform to reference standard RS 8-20.

**816.6. Mortars for Ceramic Wall and Floor Tile.** — Mortars for installing ceramic wall and floor tile shall be of the following composition measured by volume:

Walls:	Scratch coat — 1 cement	1/3 hydrated lime:	4 sand
	Setting bed and		
	Leveling coat — 1 cement	1/2 hydrated lime:	4 sand
Floors:	Setting bed — 1 cement		5 sand
Ceilings:	Scratch coat and		
	Setting bed — 1 cement	1/2 hydrated lime:	3 sand

or other mortars of comparable adhesive strength and durability, in accordance with reference standard RS 8-21.

**816.6.1. Dry-Set Portland Cement Mortars.**—Dry-set Portland Cement Mortars to be used in the installation of ceramic tile shall be in accordance with standard specification for dry-set Portland cement mortar listed in reference standard RS 8-22.

**816.7. Organic Adhesives.**—Organic adhesives to be used in installing ceramic tile shall have a shear bond strength in accordance with commercial standard for adhesives for installations of clay tile listed in reference standard RS 8-23.

## **SECTION 817.0. CONCRETE AGGREGATES**

**817.1. Aggregate Quality.**—All concrete aggregates shall conform to reference standards RS 8-24 and RS 8-25 for organic impurities, soundness, mortar strength, durability, weather-resistance, fireresistance, and wearing qualities. In addition, coarse aggregate subjected to the test for organic impurities showing a color darker than two-thirds ( $2/3$ ) the intensity of the standard color shall be rejected.

**817.2. Fireresistance.**—Coarse aggregate in concrete shall be rated in respect to the fireresistance of concrete made therewith on the basis of performance in fire test on building elements such as columns, floors, partitions and walls conducted in accordance with standard fire test specifications applicable to such test. Protective coverings or encasements of concrete for steel in fireresistive construction shall likewise be selected on the basis of performance in applicable standard fire tests. All concrete constructions shall meet the requirements of article 9 as regulated by the provisions of section 221.1. table 2-1.

**817.2.1. Grade 1 Concrete.**—Grade 1 concrete shall mean concrete made with aggregates such as blast-furnace slag, expanded clays, and calcareous, igneous, and most silicate crushed stones and gravels and shales, as well as any other aggregates performing as required by this code, for the appropriate construction when tested in accordance with standard methods of fire tests of building construction and materials as controlled by section 903.0.

**817.2.2. Grade 2 Concrete.**—Grade 2 concrete shall mean concrete made with aggregates such as cinders and crushed stones and gravels composed essentially of quartz and quartzite cherts as well as any other aggregates performing as required by this code for the appropriate construction when tested in accordance

with standard methods of fire tests of building construction and materials as controlled by section 903.0.

**817.3. Size of Aggregates.**—Fine aggregates shall be well graded from fine to coarse and shall conform to reference standards RS 8-24 and RS 8-25. Coarse aggregates shall not exceed one-fifth ( $1/5$ ) of the narrowest dimension between sides of the form nor three-fourths ( $3/4$ ) of the minimum clear spacing between reinforcing bars, and shall conform to reference standards RS 8-24 and RS 8-25.

**817.4. Special Aggregates.**—Special aggregates, including among others, perlite, vermiculite and other processed mica, pumice, lava, tufa, volcanic glass, slag, coke, expanded clay and shale used in concrete and plaster construction shall meet all the requirements of the approved rules and shall be classified in their respective fireresistant grades as determined by test. When used for fire protection purposes only, the building official may waive mortar strength requirements for such aggregates providing the concrete is shown by test to have adequate strength for the intended use.

## **SECTION 818.0. READY-MIX CONCRETE**

**818.1. Control.**—Ready-mix concrete for use in ordinary or in controlled materials procedure shall conform to reference standard RS 8-26 and other appropriate portions of section 842 for reinforced concrete.

**818.2. Transportation.**—Ready-mix concrete shall be transported in approved conveyances which insure delivery of the concrete at the site in a plastic, workable and unhardened state. The maximum amount of concrete hauled in an agitator shall not exceed the approved rating of the conveyance; and the period of delivery shall not exceed the time in which loss of plasticity may occur and generally not more than one and one-half ( $1-1/2$ ) hours, after either the introduction of the mixing water to the cement and aggregates, or the introduction of the cement to the aggregates.

**818.3. Ordinary Materials Procedure.**—When ready-mix is used under the ordinary materials procedure, either the cement content in bags per yard of concrete together with the maximum allowable water content, or the compressive strength and maximum permissible slump shall be specified. In no case shall the cement factor and water cement ratio violate the requirements



of tables RS 8-45-1 or RS 8-45-2 of reference standard RS 8-45, nor shall the specified or required twenty-eight (28) day compressive strength ( $f'c$ ) exceed four thousand (4,000) psi.

## **SECTION 819.0. STRUCTURAL WOOD GLUES**

**819.1. Quality of Glue.**—Glues used in structural assemblies of built-up or laminated lumber sections shall develop the full strength of the wood, shall not produce decomposition or deleterious chemical reaction in the wood structure, shall not be attractive to vermin and shall conform to reference standard RS 8-27.

**819.2. Manufacturer's Requirements.**—Approved structural glues shall be handled, mixed and applied as prescribed by the manufacturer and the gluing shall be done only in accordance with the timber construction standards listed in reference standard RS 8-27.

**819.3. Types of Glue.**—Structural glues shall be classified as dry use and wet use in conformance with reference standard RS 8-27.

## **SECTION 820.0. INTERIOR LATHING AND PLASTERING**

All interior lathing and plastering shall conform to the standards for lathing, furring and accessories and gypsum and Portland cement plastering listed in reference standard RS 8-28 through RS 8-32 except as may be otherwise provided in this Code for specific materials.

### **820.1. Installation.**

**820.1.1. Inspection.**—The building official shall be notified not less than twenty-four (24) hours in advance of all plastering work, and no plaster shall be applied until after the lathing or other plaster base has been inspected and approved by him.

**820.1.2. Weather Protection.**—When plastering work is in progress, the building or structure shall be temporarily enclosed and in freezing weather the enclosure shall be heated to protect the plaster from injury.

## **SECTION 821.0. EXTERIOR LATHING AND STUCCO**

All exterior lathing, plastering and stucco work shall be installed of Portland cement or other approved mortar as provided in

the reference standard RS 8-32 or as provided in this Code for specific materials.

**821.1. Reinforcement.**—All stucco work shall be reinforced with approved metal lath or wire fabric except when applied directly to a masonry or concrete base, or when installed on a masonry base which is protected with bituminous surfacing.

**821.2. Minimum Weight.**—Metal lath, expanded metal and wire reinforcing fabric shall weigh not less than the following:

Type of Reinforcement	Minimum U.S. Gage	Maximum Mesh Inches	Minimum Weight Pounds per Square Yard
Metal lath . . . . .	—	—	3.4
Expanded metal . . . . .	—	—	1.8
Woven wire . . . . .	18	1	1.74
Woven wire . . . . .	17	1-1/2	1.41
Woven wire . . . . .	16	2	1.47
Welded wire . . . . .	18	4 sq. in.	0.67
Welded wire . . . . .	17	4 sq. in.	0.82
Welded wire . . . . .	16	4 sq. in.	1.10

**821.3. Corrosion Resistance.**—All metal lath and stucco reinforcing fabric shall be protected with a zinc, or other approved rust-resistive coating or rust-inhibitive paint, or shall be manufactured from approved corrosion-resistive alloys.

**821.4. Sheathing.**—Except in back-plastered construction, the studs shall be covered with approved sheathing complying with section 855; or not less than No. 18 U.S. gage galvanized wire shall be stretched horizontally at six (6) inch centers and shall be covered with not less than fourteen (14) pound waterproof felt or paper before applying the reinforced stucco; or an approved paperbacked wire fabric may be used of not less than No. 16 U.S. gage galvanized wire with stiffening ribs not more than five (5) inches on centers to which is attached a double layer or fibrous waterproof backing. The mesh opening shall not exceed two by two (2 x 2) inches.

**821.5. Back-Plastered Construction.**—In back-plastered construction, when spacing of studs exceeds sixteen (16) inches, approved horizontal noncombustible cross-furring at not more than sixteen (16) inch centers shall be first applied; unless approved stiffened lath is used and the frame is adequately stiffened as provided in section 855.

**821.6. Application on Masonry Base.** — When applied directly to masonry or monolithic concrete, the surfaces shall be completely roughened, hacked or bush-hammered to provide bond, and a preparatory dash coat of Portland cement grout shall be applied. The dash coat shall be kept damp for at least two (2) days after application and before applying succeeding stucco coats.

**821.7. Protection.**

**821.7.1. From Freezing.** — At all times during application and for a period of not less than forty-eight (48) hours after application of each coat, provisions shall be made to keep stucco work above fifty (50) degrees F.

**821.7.2. From Moisture.** — Stucco shall be kept a sufficient height above ground surfaces as provided in section 855 and all sills, coping and projecting courses shall be flashed and provided with drips as therein specified.

**821.7.3. From Rapid Drying.** — Stucco shall be protected from heat, sun, and wind for the first forty-eight (48) hours to prevent premature drying.

**SECTION 822.0. PLASTERING MATERIALS**

All sand, quick-lime, hydrated lime, hair binder, gypsum, Keene and Portland cements, Pozzuolanic cements and aggregates and other materials used in plastering shall be stored, protected and applied in accordance with reference standards RS 8-33, RS 8-16, RS 8-32 and RS 8-13.

**822.1. Special Cements and Plasters.** — Approved cements used in plastering may have admixtures of approved plasticity agents added in the manufacturing process or when mixing the plaster at the site in the approved proportions. All premixed special plasters, cements and aggregates shall be packaged and identified with the approved label.

**822.2. Lime Plaster.** — Lime and hydrated lime plasters for use in base and finish coats shall be applied in accordance with reference standard RS 8-30 and the manufacturer's specifications.

**822.3. Gypsum Plaster.** — All gypsum plaster shall comply with reference standard RS 8-28. Gypsum plaster shall not be used on exterior surfaces.

**822.4. Gypsum Plasters with Special Aggregates.** — When gypsum is used with manufactured aggregates in place of natural sand

for plaster, the mixture shall be proportioned and applied in accordance with the manufacturer's recommendations and reference standards RS 8-28 and RS 8-31.

## **SECTION 823.0. PLASTER BASES**

**823.1. Fiber Boards.**—Approved fiber boards used as plaster bases shall comply with section 824. The surface of such boards shall be of a rough, fibrous texture to insure mechanical and suction bond; and the boards shall meet the bond and strength tests specified by reference standard RS 8-34.

**823.2. Gypsum Lath.**—Except when greater thickness is required for fire-resistance under the provisions of article 9, or as herein specified, gypsum lath used for plastering shall be not less than three-eighths ( $3/8$ ) inch thick and shall comply with reference standard RS 8-35.

**823.3. Perforated Gypsum Lath.**—Where required to provide specified time-temperature performance, perforated gypsum lath shall be not less than three-eighth ( $3/8$ ) inches thick. The openings shall be equivalent to three-quarter ( $3/4$ ) inch diameter holes for each sixteen (16) square inches of lath surface; or the lath shall be perforated as determined by full size tests for load, strength and fire-resistance ratings.

**823.4. Metal Lath.**—The dimensions and sizes of expanded, ribbed and sheet metal lath shall comply with reference standard RS 8-32, and shall be fabricated from not less than No. 30 U.S. gage steel sheets. It shall be manufactured from copper-bearing steel, coated with rust-inhibitive paint after cutting, or cut from zinc-coated steel sheets.

**823.5. Wire Lath.**—All types of wire lath shall comply with reference standard RS 8-32, and shall be fabricated from woven or welded wire of not less than No. 19 W&M gage with not more than two and one-half ( $2-1/2$ ) meshes to the inch. Woven or welded wire reinforcement shall be coated with zinc or rust-inhibitive paint.

**823.6. Paper-Backed Lath.**—Expanded metal or wire lath backed with integral approved paper shall be fabricated from the minimum gages and weights specified in sections 823.4 and 823.5.

**823.7. Combustible Lath.**—Wood lath shall be erected horizontally on walls and partitions and ceiling lath shall run in one

direction only; but in neither case shall it extend through cross-partitions from room to room. Wood lath shall be not less than one (1) inch wide nor less than five-sixteenth ( $5/16$ ) inches thick. The lath joints shall be staggered so that not more than seven (7) laths occur in any one continuous break.

## **SECTION 824.0. FIBER BOARDS**

Insulating boards manufactured with wood or other vegetable fibers used as building boards for sheathing, roof decks, plaster bases, interior wall and ceiling finish, roof insulation or sound deadening, shall be vermin proof, resistant to rot-producing fungi and water-repellent and shall meet the strength and durability tests specified in reference standard RS 8-34. When required under the provisions of article 9, the boards shall be protected or treated to develop the required fireresistance or flameresistance as determined by test.

**824.1. Jointing.**—To insure tight-fitting assemblies, edges shall be manufactured square or shiplapped, beveled, tongue-and-grooved or U-jointed; and shall be installed in accordance with reference standard RS 8-32.

**824.2. Plaster Base.**—When used as a plaster base, fiber boards shall be permitted in fireresistive construction complying with the test provisions of article 9, except where specifically prohibited in fireproof (type 1) and noncombustible (type 2) construction.

**824.3. Roof Insulation.**—When used as roof insulation in all types of construction, fiber boards shall be protected with an approved type of roof covering.

**824.4. Wall Insulation.**—When installed and firestopped to comply with article 9, fiber boards may be used for wall insulation in all types of construction. In firewall and fire division construction, unless treated to be noncombustible, the boards shall be cemented directly to the masonry or other noncombustible base and shall be protected with an approved noncombustible veneer anchored to the base without intervening air spaces.

**824.5. Dry Wall Construction.**—Where fireresistance ratings are required, provision shall be made for interlocking, lapping or otherwise protecting the joints between adjacent boards to insure smoke and flame tightness.

**824.6. Insulating Roof Deck.**—When used as roof decking in open beam construction fiber board insulating roof deck shall have a minimum nominal thickness not less than one (1) inch.

## **SECTION 825.0. PLYWOOD**

**825.1. Quality.**—All plywood when used structurally shall meet the performance standards and all other requirements of reference standard RS 8-36 for the type, grade and identification index or species group of plywood involved, and shall be so identified by an approved agency. Working stresses shall conform to the standards of accepted engineering practice as presented in reference standard RS 8-36.

**825.2. Types.**—Plywood for interior use may be either of the moisture resistant or exterior type; plywood for exterior use shall be of the exterior waterproof type. Exterior plywood may be applied directly to the framing as a siding, provided it has a nominal thickness of three-eighths ( $3/8$ ) inch. Joints shall occur over framing members, unless wood or plywood sheathing is used or joints are lapped horizontally a minimum of one and one-half ( $1-1/2$ ) inches or otherwise made waterproof to the satisfaction of the building official. If plywood is used as lapped siding without sheathing, the wall framing to which it is attached shall be diagonally braced.

**825.3. Spans.**—The maximum spans for plywood roof sheathing and subflooring shall be limited by the allowable stresses and deflections for the design live load but shall have not less than the identification index listed in reference standard RS 8-36 item 4, provided it is continuous over two (2) or more spans and laid with face grain perpendicular to the supports.

**825.3.1.**—The allowable span for plywood combination subfloor underlayment shall conform to the provisions of reference standard RS 8-36 item 5.

**825.3.2. Vertical Maximum Stud Spacing.**—Stud spacing for vertical sheathing and for use in stress-skin panel or other prefabricated constructions shall be determined by accepted engineering analysis or by the tests prescribed for prefabricated assemblies in section 803.

**SECTION 826.0. WALLBOARDS AND SHEATHING**

**826.1. Sheathing.**—Sheathing of gypsum, processed fiber and other approved materials shall conform to reference standards RS 8-39 and RS 8-40. When used in frame construction, they shall meet requirements of sections 855.1 and 855.2. When required to meet fireresistance ratings the assembled construction shall comply with section 221.1 table 2-1 for structural elements and article 9 for trim and finishes.

**826.2. Wallboards.**—Wallboard of gypsum, processed fiber and other approved materials shall conform to reference standard RS 8-41. When required to meet fireresistance ratings the assembled construction shall comply with section 221.1 table 2-1 for structural elements and article 9 for trim and finishes.





**STEEL, MASONRY, CONCRETE, GYPSUM AND LUMBER CONSTRUCTION**

827.0	Structural Steel Construction	844.0	Ordinary Concrete
828.0	Cold-Formed Steel	845.0	Omitted
829.0	Open Web Steel Joists	846.0	Short Span Floor Filling
830.0	Reinforcing Steel	847.0	Concrete-filled Pipe Columns
831.0	Cast Steel Construction	848.0	Pneumatic Concrete
832.0	Cast Iron Construction	849.0	Minimum Concrete Dimensions
833.0	Special Steels	850.0	Reinforced Gypsum Concrete
834.0	Light Weight Metal Alloys	851.0	Reinforced Brickwork
835.0	Masonry Wall Construction	852.0	Reinforced Hollow Block Construction
836.0	Bonding of Walls		
837.0	Lateral Bracing of Walls	853.0	Lumber and Timber Con- struction
838.0	Chases and Recesses in Bearing Walls	854.0	Heavy Timber Type Construction
839.0	Corbeled and Projected Masonry	855.0	Wood Frame Construction
840.0	Bearing on Hollow Unit Walls	856.0	Stress Skin Panels
841.0	Plain Concrete	857.0	Structural Glued, Laminated and Built-Up Lumber Con- struction
842.0	Reinforced Concrete		
843.0	Controlled Concrete		

**SECTION 827.0. STRUCTURAL STEEL CONSTRUCTION**

Structural steel construction used in all buildings and structures shall be fabricated from materials of uniform quality, free from defects that would vitiate the strength or stability of the structure. Design, fabrication and erection shall conform to reference standard RS 8-42.

**827.1. Plans.**—Design plans drawn to appropriate scale shall show the size, section and relative locations of all structural members with floor levels, column centers and all offsets fully dimensioned; and the design loads shall be clearly indicated for all parts of the building or structure.

**827.2. Identification.**—Structural steel that is required to have a minimum yield point greater than thirty-six thousand (36,000) psi shall at all times in the fabricator's plant, be marked, segregated, or otherwise handled so that the separate alloys and tempers are positively identified, and after completion of fabrication, shall be marked to identify the alloy and temper. Such

markings shall be affixed to completed members and assemblies or to boxed or bundled shipments of multiple units prior to shipment from the fabricator's plant.

**827.3. Shop Drawings.**—Shop drawings, giving complete information necessary for the fabrication of the component parts of the structure, including the types of material, the location, type and size of all rivets, bolts and welds, shall be prepared in advance of the actual fabrication. They shall clearly distinguish between shop and field rivets, bolts and welds. Shop drawings shall be made in conformity with the best modern practice and with due regard to safety, speed and economy in fabrication and erection.

**827.4. Welding.**—All welded construction shall be designed by engineers and shall be supervised by engineers and qualified technicians experienced and skilled in welded construction. Welds shall be made by welders, tackers and welding operators who have been previously qualified to perform the type of work required, by tests as prescribed in reference standard RS 8-73. Unless otherwise specifically provided for in this Code or reference standards, all provisions of reference standard RS 8-73 shall apply.

**827.5. Painting and Protective Coating of Structural Steel.**

**827.5.1.**—All structural steel, except as provided in 827.5.2, shall receive one (1) coat of paint, zinc or bituminous coating, or equivalent metal protection before erection. The protection shall be applied thoroughly and evenly to dry surfaces which have been cleaned of loose mill scale, loose rust, weld slag flux deposit, dirt, and other foreign matter. Oil and grease deposits shall be removed by solvent. Surfaces inaccessible after assembly shall be treated as required above prior to assembly.

**827.5.2.**—Surfaces of structural steel shall not be required to receive metal protection when the structural steel is used under the conditions listed in a through g below. However, these surfaces shall be cleaned of oil or grease by solvent cleaners and be cleaned of dirt and other foreign material by thorough brushing with a fiber brush.

- a. Structural steel that is encased in concrete or surfaces that abut concrete at interior locations.
- b. Structural steel encased in non-corrosive fire resistive materials that are bonded or secured to the steel surface by an approved method that will insure a durable bond.
- c. Surfaces of structural steel that are to be riveted, bolted, or welded together.

- d. Surfaces of structural steel within two (2) inches of field welds shall be free of protective coatings that would prevent proper welding or produce objectionable fumes while welding is being done.
- e. Surfaces of structural steel that have been machine finished but shall be protected against corrosion by a rust-inhibiting coating that can be easily removed prior to erection of which has characteristics that make removal unnecessary prior to erection.
- f. Surfaces of types of structural steels that have been specifically approved for use without metal protection.
- g. Structural steel members that are completely concealed by interior finish such as lath and plaster, masonry, etc., need not be painted except that where such members are adjacent to piping, are in shower or steam rooms, are exposed to chemical fumes, or are exposed to other conditions of potentially aggressive corrosion, such members shall be painted.

**827.5.3.**—Parts of structural steel members left unpainted because of welding, bolting, or riveting operations not exempted from painting by the provisions of 827.5.2 above shall receive a field application of metal protection as prescribed in 827.5.1 above.

**827.5.4.**—Structural steel that will remain exposed to the weather or to a corrosive atmosphere shall receive an additional coat of metal protection of another color after erection, except for types of structural steels that have been specifically approved for use under exposure to the weather without metal protection.

**827.5.5.**—All abrasions to, or deterioration of, the protective coating shall be spot painted.

**827.5.6.**—Primary frame steel built into exterior masonry walls shall have adequate protection against corrosion by encasing in one and one-half (1-1/2) inches of Portland cement mortar or by a mastic asphalt or pitch one-eighth (1/8) inch thick or its approved equivalent.

## **827.6. Quality Control.**

**827.6.1. Reference.**—The provisions of reference standard RS 8-60 shall apply.

**827.6.2. Welding Operations.**—The certification of welding operations prescribed by reference standard RS 8-60 shall include a check to ascertain that the welders employed on the work are qualified in accordance with the provisions of this code.

## **SECTION 828.0. COLD-FORMED STEEL**

**828.1. General Requirements.**—Materials, design, and construction methods shall meet the requirements of reference standard RS 8-43.

**828.2. Deleted.**

**828.3. Structural Systems.**—Formed steel floor, wall, and roof systems may be designed and constructed to resist all vertical and horizontal moments and shears resulting from lateral forces. Such members when designed to transmit horizontal shears due to wind or other lateral forces, shall be connected to the supporting structure so as to adequately resist all primary and secondary stresses. When concrete topping or other approved decking is installed in a manner to insure composite action of the assembly, the strength of the composite member may be included in the calculations.

**828.4. — Deleted.**

**828.5. Protection.**

**828.5.1. Shop Coat.**—All individual structural members and assembled panels of light gage and formed steel construction, except where fabricated of approved corrosion-resistive metallic steel or of steel having a corrosion-resistive or other approved coating, shall be protected against corrosion with an approved shop coat of paint, enamel, or other approved protection.

**828.5.2. Field Coat.**—After erection where directly exposed to the weather, except when encased in concrete made of non-corrosive aggregates, or where fabricated of approved corrosion-resistive steel, or of galvanized or otherwise adequately protected steel, individual structural members and assembled panels of light gage and formed steel construction shall be given an additional coat of approved protection.

**828.5.3. Siding.**—Exposed siding or sheathing shall be fabricated of approved corrosion-resistive steel or otherwise protected at the ground level for a height of four (4) feet above grade.

**828.5.4. Protection at Exterior Walls.**—Floor or roof construction which extends into an exterior wall shall be adequately waterproofed and protected from the weather to prevent corrosion.

**828.6. Tests.**—When not capable of design by accepted engineering analysis, the building official shall require tests of the individual or assembled structural units and their connections as prescribed in reference standard RS 8-43. At least three (3) specimens truly representative of the construction to be used

in practice shall be subjected to the prescribed test and the mean of the results shall determine the safe working value; provided that any individual test varying more than ten (10) per cent from the mean value shall cause rejection of the series.

## **SECTION 829.0. OPEN WEB STEEL JOISTS**

Steel joists may be used as secondary members in floor and roof construction, other than around stairwells, shafts and other floor openings. The materials, design, and construction methods shall meet the requirements of reference standard RS 8-44.

### **829.1. Design.**

**829.1.1. Loads and Stresses.**—Connections of all members shall be designed with the minimum possible eccentricity and all secondary stresses shall be included with primary stresses in the design. In all buildings subject to heavy concentrations or moving loads, the construction shall be designed to resist the vertical and lateral components of such loads in addition to the live and dead loads specified in article 7.

**829.1.2. Partitions.**—The joists shall be designed to support the dead load of partitions wherever they occur in addition to all other imposed dead and live loads.

**829.2. Protection.**—Painting of steel joists shall be in accordance with the requirements of section 828 for light gage cold-formed steel; or the joists shall be dipped in an approved hot asphalt, or shall be protected by painting, dipping or spraying with approved cold asphalt at the place of manufacture. The paint or asphalt coating shall conform to the requirements of reference standard RS 8-44 and shall have a minimum dry film thickness of 1.0 mil. All abrasions shall be touched up at the job site with the same material.

**829.3. Height and Area Limitations.**—When the main structural frame is designed to resist all horizontal and vertical moments and shears due to lateral forces, and the secondary system consists of steel joists which are attached to the supporting beams and girders of the frame as specified in the standard, steel joist construction of the required fire-resistance may be used in all buildings within the height limits of section 221.2 table 2-2.

**829.4. Tests.**—When not subject to accepted engineering analysis as regulated by reference standard RS 8-44, the assembly shall meet the load test requirements specified in sections 803 and 804.

## **SECTION 830.0. REINFORCING STEEL**

Metal reinforcement for reinforced concrete, reinforced gypsum concrete, reinforced brickwork and reinforced hollow block construction shall comply with the applicable standards listed in reference standard RS 8-45.

**830.1. Identification.**—All reinforcing bars shall be rolled with raised symbols or letters impressed on the metal identifying the manufacturing mill, the bar size, and the minimum yield point. When required by the building official, the grade of material shall be identified by satisfactory mill tests. All bundles or rolls of cold-drawn steel wire reinforcement and of one-quarter (1/4) inch rounds shall be securely tagged to identify the manufacturer and the grade of steel.

**830.2. High Yield Steels.**—When the yield point of reinforcing bar steel is fifty thousand (50,000) pounds per square inch or more, and when not otherwise provided for in reference standard RS 8-45, the building official shall approve working stresses for tension in bending and compression in vertical column reinforcement not more than forty (40) per cent of the minimum yield point; but such working stresses shall be not more than thirty thousand (30,000) pounds per square inch, except when prestressed reinforcement is used.

**830.3. Column Reinforcement.**

**830.3.1. Structural Steel Sections.**—The allowable unit stress on structural steel column sections shall be not more than the values listed in reference standard RS 8-42.

**830.3.2. Cast Iron Sections.**—All cast iron used as reinforcement in combination with concrete shall be of pit-cast water pipe grade complying with the standards listed in reference standard RS 8-46, and the allowable unit stress shall be not more than ten thousand (10,000) pounds per square inch.

**830.3.3. Steel Pipe Sections.**—The allowable unit stress on steel pipe used in concrete-filled pipe columns shall be in conformance with section 847.0.

**830.4. Tests.**—When unidentified reinforcement is approved for use under ordinary material procedure, not less than three (3) tension and three (3) bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

## SECTION 831.0. CAST STEEL CONSTRUCTION

**831.1. Materials.**—Carbon steel casting for building construction shall be cast from open hearth or basic oxygen steel conforming to the requirements of reference standard RS 8-47. All castings shall be free from injurious blow holes or other defects which would impair the structural strength.

**831.2. Higher Strength Cast Steel.**—Higher strength cast steel may be used when approved under controlled material procedure.

**831.3. Welding Cast Steel.**—Cast steel designed for use in welding shall be of weldable grade complying with the approved rules.

## SECTION 832.0. CAST IRON CONSTRUCTION

**832.1. Materials.**—Cast iron for building construction shall be a good foundry mixture providing clean, tough, gray iron, free from serious blow holes, cinder spots and cold shuts; conforming to the applicable standards listed in reference standard RS 8-48.

**832.2. Limitations of Use.**—Cast iron columns shall not be used where subject to eccentric loads which produce a net tension in the section, nor in any part of a structural frame which is required to resist stress due to wind. Cast iron columns shall not be used in the primary structural frames of buildings whose height exceeds one hundred (100) feet or twice the width at the ground level. Cast iron shall not be used for columns required to have four (4) hour fireresistive protection. Cast iron columns supporting a floor shall not be longer than seventy (70) times the least radius of gyration or twenty-four (24) times the outside diameter or least side. Cast iron columns supporting roof loads only shall not be longer than ninety-six (96) times the least radius of gyration or thirty (30) times the outside diameter or least side, cast iron columns shall not be smaller than six (6) inches in outside diameter or side.

**832.3. Multi-Story Columns.**—Cores of superimposed columns shall be of the same dimensions above and below a splice. When a column of smaller diameter is superimposed over one of larger diameter, the larger column shall be tapered down to the smaller diameter over a length of not less than six (6) inches.

**832.3.1. Column Bases of Steel and Iron.**—Cast iron bases shall be planed on top and bases which rest on structural steel members shall be planed on the bottom.

**832.4. Thickness of Metal.**—The minimum thickness of cast iron shall be not less than herein specified:

**832.4.1. Columns.**—In columns, the metal shall be not less than one-twelfth ( $1/12$ ) the smallest dimension of the cross-section and in no case less than three-quarter ( $3/4$ ) inch.

**832.4.2. Bases and Brackets.**—In bases and flanges, the metal shall be not less than one (1) inch thick reinforced with fillets and brackets. The outer edge of the ribs of ribbed bases shall be inclined not less steeply than forty-five (45) degrees. A side of the bed plate of ribbed bases exceeding three (3) feet in length shall have a reinforcing flange at least three (3) inches high.

**832.4.3. Lintels.**—In lintels, the metal shall be not less than three-quarter ( $3/4$ ) inches thick and shall be limited to use on spans of not more than six (6) feet.

**832.5. Inspection.**—No cast iron column shall be erected in place before it has been inspected and approved by the building official. The use of any cast iron column in which blow holes or imperfections reduce the effective area of the cross-section more than ten (10) per cent shall be prohibited. Where required by the building official, hollow cast iron columns, except when open at both ends and without flanges, shall have two (2) three-eighths ( $3/8$ ) inch holes drilled in the shell to exhibit the thickness thereof. If the columns are cast on the side, both holes shall be in the top side as cast, one hole about twelve (12) inches toward each end from mid-length of the column. If the columns are cast on end, both holes shall be at mid-height at ninety (90) degrees from one another about the axis of the column. Additional holes shall be drilled when required by the building official. If the core of a cast iron column is found to have shifted more than one quarter ( $1/4$ ) the thickness of the shell, the strength shall be computed assuming the thickness all around to be that of the thinnest part.

## **SECTION 833.0. SPECIAL STEELS**

**833.1. Identification.**—When not otherwise provided for by reference standard RS 8-42, silicon, nickel and other corrosion-resistive alloy steels and high strength steels required to have a minimum yield point greater than thirty-six thousand (36,000) psi, may be used in the design and construction of buildings and structures with the approval of the building official. Every such special steel shall be marked or otherwise identified to



clearly distinguish it from all other classes of steel.

**833.2. Design and Workmanship.**—When not otherwise provided for by reference standard RS 8-42, design and fabrication methods shall conform to the approval of the building official.

## **SECTION 834.0. LIGHTWEIGHT METAL ALLOYS**

Aluminum and other approved lightweight metals and alloys shall be used for structural purposes in buildings and structures in accordance with the applicable standards listed in reference standard RS 8-49.

## **SECTION 835.0. MASONRY WALL CONSTRUCTION**

**835.1. Design.**—All masonry construction shall comply with the provisions of this article governing quality of materials and manner of construction; and shall be of adequate strength and proportions to support all superimposed loads either within the empirical provisions of the applicable sections of article 8 or reference standard RS 8-51 or shall be designed in accordance with reference standards RS 8-50 and RS 8-58.

**835.2. Wetting of Masonry.**

**835.2.1. Clay or Shale Bricks.**—All brick having an absorption rate in excess of 0.025 oz. per square inch per minute shall be wetted before laying. The method of wetting shall be such as to insure that each unit is nearly saturated, surface dry when laid. During freezing weather, units that require wetting shall be sprinkled with warm water, immediately before laying and shall be protected against formation of films of ice. No units with ice on the surface shall be laid.

**835.2.2. Structural Clay Tile.**—Structural clay tile having a one (1) hour boiling water absorption of twelve (12) per cent or more shall be wetted before laying.

**835.2.3. Concrete Masonry Units.**—Concrete masonry units shall not be wetted before laying.

**835.3. Precautions Against Freezing.**—Adequate equipment shall be used for heating the masonry materials and protecting the masonry during freezing or near-freezing weather. No frozen material or materials containing ice shall be used.

Sand shall be heated in such a manner as to remove frost or ice. Water or sand shall not be heated to a temperature above

one hundred and sixty (160) degrees F. When necessary to remove frost, the masonry units shall be heated.

When the outside temperature is below forty (40) degrees F., an air temperature of at least forty (40) degrees F. shall be maintained on both sides of the masonry for a period of at least forty-eight (48) hours if type M mortar is used and seventy-two (72) hours if type N or O mortar is used. These periods may be reduced to twenty-four (24) and forty-eight (48) hours, respectively, if high-early-strength cement is used. For type S mortars or stronger, the masonry shall be moist and above fifty (50) degrees F. for seventy-two (72) hours without drying. All methods and materials for the protection of the fresh masonry work against freezing shall be subject to the approval of the building official. In general, methods and materials commonly accepted as suitable for the protection of reinforced concrete construction in freezing weather shall be used. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.

**835.4. Incorporation of Combustibles.**—No lumber or other combustible materials, except nailing blocks and ornamental timber to an extent permitted by the chasing restrictions of section 838 and the provisions of section 900.2 shall be incorporated in masonry walls, except as approved for combustible aggregates or component materials after fire test.

**835.5. Use of Existing Masonry Walls.**—An existing masonry wall may be used in the construction of a post-code building and in the repair, alteration or enlargement of a building providing it meets the requirements of this code, and is structurally sound or can be made so by reasonable repairs. Existing masonry walls which are structurally sound but which are of insufficient thickness for their proposed use shall be strengthened by an addition of similar material not less than six (6) inches in thickness laid in mortar of required proportions. Foundations and lateral supports shall be provided as required for newly constructed walls under similar conditions. Such additions or linings shall be thoroughly bonded to the existing masonry by means at least equivalent to those in section 836.0. If the existing wall is covered with plaster or other covering that might impair the bond of the lining, such covering shall be stripped off and the masonry cleaned. The repair, lining, or other strengthening of an existing masonry wall to be used in the construction of a post-code building and in the repair,

alteration or enlargement of a building shall be in every respect satisfactory to the building official and subject to such conditions as he may in any case prescribe.

**835.6. Mortar Coverage.**—Hollow units shall be laid with full mortar coverage on horizontal face shells, and all head or end joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the longitudinal face shells, except that full web and face-shell bedding shall be used in loadbearing masonry if required by structural design. Solid units shall be laid with full head and bed joints.

## **SECTION 836.0. BONDING OF WALLS**

All multiple wythe masonry loadbearing and non-loadbearing walls shall be bonded in accordance with one of the methods indicated in sections 836.0.1 through 836.0.3.

**836.0.1. Bonding with Masonry Headers.**—Where the facing and backing of solid masonry construction are bonded by means of masonry headers, at least four (4) per cent of the wall surface of each face shall be composed of headers extending at least three (3) inches into the backing. The distance between adjacent full length headers shall not exceed twenty-four (24) inches either vertically or horizontally. In walls in which a single header does not extend through the wall, headers from the opposite sides shall overlap at least three (3) inches or headers from opposite sides shall be covered with another header course overlapping the header below at least three (3) inches.

**836.0.2. Bonding with Metal Ties.**—The facing and backing (adjacent wythes) of masonry walls shall be bonded with corrosion-resistant three-sixteenths ( $3/16$ ) inch diameter (one-eighth ( $1/8$ ) inch diameter for veneer), steel ties or metal wire of equivalent stiffness embedded in the horizontal mortar joints. There shall be at least one (1) metal tie for each four and one-half ( $4-1/2$ ) square feet of wall area. Ties shall not be aligned vertically insofar as possible or practical. The maximum vertical distance between ties shall not exceed twenty-four (24) inches and the maximum horizontal distance shall not exceed thirty-six (36) inches, except that for cavity walls having less than a four (4) inch wythe, the maximum vertical distance between ties shall not exceed sixteen (16) inches or two (2) courses of masonry units, whichever is greater. Rods or ties bent to rectangular shape

shall be used with hollow masonry units laid with the cells vertical. In other walls, the ends of ties shall be bent to ninety (90) degree angles to provide hooks at least two (2) inches long. Additional bonding ties shall be provided at all openings and shall be spaced not more than three (3) feet apart around the perimeter and within twelve (12) inches of the opening.

Walls bonded in accordance with this section or section 836.0.3 shall conform to the allowable stress, lateral support, thickness, height, and mortar requirements for cavity walls unless the collar joints in such walls are filled with mortar.

**836.0.3. Bonding with Prefabricated Joint Reinforcement.**—The facing and backing (adjacent wythes) of masonry walls may be bonded with prefabricated joint reinforcement. There shall be at least one (1) cross wire serving as a tie for each four and one-half (4-1/2) square feet of wall area. The vertical spacing of the reinforcement shall not exceed sixteen (16) inches or two (2) courses of masonry units, whichever is greater. The longitudinal bars or wires shall be not less than No. 9 gage and the joint reinforcement shall meet the approval of the building official. At least one (1) longitudinal bar or wire shall be provided for each six (6) inches of wall thickness or fraction thereof.

**836.1. Ashlar, Natural or Cast Stone.**—In ashlar masonry, bond stones uniformly distributed shall be provided to the extent of at least ten (10) per cent of the wall area. Such bond stones shall extend at least four (4) inches into the backing wall. Rubble stone masonry, twenty-four (24) inches thick or less, shall have bond stones with a maximum spacing of three (3) feet vertically or horizontally and, if the masonry is thicker than twenty-four (24) inches shall have one (1) bond stone for each six (6) square feet of wall surface on both sides.

**836.2. Buttresses and Piers.**—All buttresses shall be bonded into the wall by a masonry bond. The piers and buttresses shall have sufficient strength and stability with sufficient bonding or anchorage between the walls and the supports to resist wind pressure and suction.

**836.3. Bonding of Intersecting Walls and Partitions.**—Masonry walls and partitions shall be securely anchored or bonded at points where they meet or intersect by one of the following methods:

**836.3.1. Bonding.**—Walls may be bonded by laying at least fifty (50) percent of the units at the intersection in a true masonry bond with alternate units having a bearing of at least

three (3) inches upon the unit below, by metal ties, joint reinforcement, anchors as specified in 836.3.3 below, or by other equivalent method.

**836.3.2. Interior Non-Loadbearing Walls.**—Interior non-loadbearing walls shall be anchored at their intersection, at vertical intervals of not more than two (2) feet on centers, with at least twenty-two (22) gage corrosion-resistant, corrugated metal ties at least seven-eighths (7/8) inches wide extending at least four (4) inches into the masonry or with other ties which provide equivalent anchorage.

**836.3.3. Walls Carried Up Separately.**—Where the courses of meeting or intersecting walls are carried up separately corner intersections shall be made by regularly tothing or blocking with eight (8) inch maximum offsets and providing metal anchors having a minimum section of one-quarter (1/4) inch by one and one-half (1-1/2) inches with ends bent up at least two (2) inches, or cross pins at the joints. Such anchors shall be at least two (2) feet long with a maximum vertical spacing of four (4) feet. Other types of metal ties, joint reinforcement, or anchors shall be spaced to provide equivalent anchorage at the intersection.

**836.4. Erection Precautions.**—Temporary bracing shall be used wherever necessary to take care of any loads to which the walls may be subjected during erection. Such bracing shall remain in place as long as may be required for safety.

**836.5. Bonding Faced or Composite Walls.**—Faced or composite walls may be bonded as provided for in sections 836.0.1, 836.0.2, and 836.0.3. Where the facing and backing are bonded by means of masonry headers, such headers shall extend at least three (3) inches into a hollow masonry back-up unit specifically designed to receive and provide mortar bedding for the header.

**836.6. Bonding Cavity and Masonry Bonded Hollow Walls.**

**836.6.1. Cavity Walls.**—Wythes of cavity walls shall be bonded as required in sections 836.0.2 or 836.0.3.

**836.6.2. Masonry Bonded Hollow Walls.**—Wythes of masonry bonded hollow walls shall be bonded as required in section 836.0.1.

**836.7. Masonry Laid In Stack Bond.**—Where unit masonry is laid in stack bond, continuous prefabricated joint reinforcement or other steel bar or wire reinforcement shall be embedded in

the horizontal mortar beds at vertical intervals not to exceed sixteen (16) inches.

**836.8. Longitudinal Bond.**—In each wythe of masonry load-bearing and non-loadbearing walls, at least sixty (60) per cent of the stretchers in any transverse vertical plane shall lap the units above the below at least two (2) inches or one-third (1/3) the height of the unit, whichever is greater, or the masonry walls or partitions shall be reinforced longitudinally as required in section 836.7.

## **SECTION 837.0. LATERAL BRACING OF WALLS**

Lateral support for masonry walls may be obtained by cross walls, columns, pilasters, or buttresses, where the limiting distance is measured horizontally; or by floors, roofs, spandrel beams, or girts, where the limiting distance is measured vertically. Sufficient bonding or anchorage shall be provided between the walls and the supports to resist the assumed wind or other horizontal forces, acting either inward or outward, and shall meet the requirements of sections 837.2 and 837.3. All members relied upon for lateral support shall be designed on the basis of allowable stress and shall have sufficient strength to transfer the horizontal force, acting in either direction, to adjacent structural members or to the ground. Where walls are dependent upon floors or roofs for their lateral support, provision shall be made in the building to transfer the lateral forces to the ground.

**837.1. Bracing.**—Masonry walls, whether loadbearing or non-loadbearing, shall be provided with lateral support by means of horizontal or vertical members or constructions at intervals not to exceed those specified in reference standards RS 8-50 and RS 8-58 or, for non-loadbearing walls or for loadbearing walls where it is desired to obviate the need for structural analysis, at intervals not to exceed those specified in this section.

Where a masonry wall containing no openings is supported in both horizontal and vertical spans, the allowable distance between lateral supports as indicated in this section may be increased; but if both horizontal and vertical distances exceed the allowable distance, the sum of the horizontal and vertical spans between supports may be no more than three (3) times the allowable distance permitted for support in only one direction.

**837.1.1. Load Bearing Exterior Masonry Walls.**—Except as provided in reference standard RS 8-51, loadbearing exterior masonry walls shall be proportioned on the basis of structural analysis.

**837.1.2. Non-Loadbearing Exterior Masonry Walls.**—In lieu of structural analysis, non-loadbearing exterior masonry walls may be proportioned so that the maximum slenderness ratio does not exceed twenty (20). In the case of a gable, the height of the wall shall be based on the average height. Where the wall panel contains openings having a dimension in excess of fifty (50) per cent of the corresponding dimension of the panel, the wall shall be proportioned by structural analysis.

**837.1.3. Interior Loadbearing Walls.**—In lieu of analysis of stresses, interior loadbearing masonry walls may be proportioned so that the maximum slenderness ratio does not exceed twenty (20).

**837.1.4. Partitions.**—The distance between lateral supports of a partition shall not exceed forty-eight (48) times its normal thickness, excluding plaster, when supported in the horizontal span by piers, cross walls, etc., nor thirty-two (32) times its nominal thickness, excluding plaster when supported in the vertical span.

**837.1.5. Faced or Composite Walls.**—The slenderness ratio for faced or composite walls shall not exceed the value allowed for the weakest of the combination of masonry units or mortars of which the wall is composed.

**837.1.6. Rubble Stone Masonry.**—In lieu of structural analysis, rubble stone masonry walls may be proportioned so that the slenderness ratio does not exceed fourteen (14) for exterior walls and sixteen (16) for interior walls.

## **837.2. Floor Anchorage.**

**837.2.1. Wood Joists.**—Wood floor joists five (5) feet or more above grade bearing in masonry walls shall be anchored to the wall at intervals not to exceed six (6) feet by metal anchors having a minimum cross section of 0.25 square inches and at least sixteen (16) inches long. The anchors shall be securely fastened to the joists and built at least three and one half (3-1/2) inches into the masonry. Joists five (5) feet or more above grade and parallel to the walls shall be tied to the wall with metal straps that are spaced not more than eight (8) feet on centers and that engage at least three (3) joists. Anchors shall be in line with the bridging or blocking.

**837.2.2. Steel Joists.**—Steel floor joists bearing on masonry shall be anchored to the masonry in a manner at least equivalent to that required for wood joists.

**837.2.3. Concrete Slabs.**—Concrete slabs bearing on masonry walls require no additional anchorage, except as may be required by section 838.5.

**837.2.4. Continuity.**—The ends of joists, rafters, beams, or girders required to be anchored into walls or bearing partitions shall be continuous and the opposite end shall be similarly anchored into a wall or bearing partition. However, if discontinuous, the discontinuous ends shall lap each other at least six (6) inches and shall be well bolted or spiked together, shall be butted and fastened by metal straps or ties, or other means shall be provided for the transfer of thrust between the discontinuous ends.

**837.3. Roof Anchorage.**—Roof construction, other than cast-in-place concrete slabs, shall be securely anchored to loadbearing masonry walls with minimum one half (1/2) inch bolts spaced eight (8) feet on center, or their equivalent. The bolts shall extend and be embedded a minimum of fifteen inches (15'') vertically into the masonry, or where a continuous bond beam is provided, shall be hooked tightly around or welded to at least 0.2 square inches of continuous longitudinal bond beam reinforcement placed at least six (6) inches from the top of the wall.

## **SECTION 838.0. CHASES AND RECESSES IN BEARING WALLS**

**838.1. Where Permitted.**—Chases and recesses shall be prohibited in any wall less than twelve (12) inches thick or in the required area of piers and buttresses. Vertical chases adjacent to bearings of beams or lintels, vertical chases wider than twelve (12) inches, and all horizontal chases shall be proportioned on the basis of the analysis of stress.

**838.1.1. Exceptions for Eight Inch Walls.**—In buildings of residential occupancy not over two (2) stories in height, vertical chases not more than four (4) inches deep and not more than four (4) square feet of wall area may be built in eight (8) inch walls, except that recesses below windows may extend from floor to sill and be the width of the opening above.



**838.2. Maximum Size.**—The maximum permitted depth of a chase in any wall shall be not more than one-third ( $1/3$ ) the wall thickness, and the maximum length of a horizontal chase or the maximum horizontal projection of a diagonal chase shall not exceed four (4) feet except as provided in section 838.5; and except further that the length of the apron below window sills in all walls may equal the width of the window opening. The aggregate area of recesses and chases in any wall shall be not more than one fourth ( $1/4$ ) of the area of the face of the wall in any one story. Masonry directly above chases or recesses wider than twelve (12) inches shall be supported on lintels.

**838.3. Fireresistive Limitations.**—It shall be unlawful to have chases or recesses which reduce the thickness of material below the minimum specified in article 9 for fire walls, fire divisions, fire partitions or required fireprotective covering of structural members.

**838.4. Hollow Walls.**—When chases and recesses are permitted in hollow walls and walls constructed of hollow blocks or tile, they shall be built-in with the wall. It shall be unlawful to cut chases in such walls after erection.

**838.5. Continuous Chases.**—Horizontal chases for the bearing of reinforced concrete floor and roof slabs may be continuous provided anchors are installed above and below the floor construction to resist the bending and uplift in the wall due to flexure of the slab.

## **SECTION 839.0. CORBELED AND PROJECTED MASONRY**

**839.1. Limitations.**—No wall less than twelve (12) inches thick shall be corbeled except to support firestopping around floor framing; and except that eight (8) inch foundation walls may be corbeled to support brick-veneer frame and ten (10) inch cavity walls as provided in section 871. The maximum total horizontal projection of corbels shall be not more than one-half ( $1/2$ ) the thickness of the wall. The maximum projection of one (1) unit shall neither exceed one-half ( $1/2$ ) the depth of the unit nor one-third ( $1/3$ ) its width at right angles to the face which is offset.

**839.2. Hollow Walls.**—Corbeling of hollow masonry or masonry built of hollow units shall be supported on at least one (1) full course of solid masonry.

**839.3. Molded Cornices.**— Unless structural support and anchorage is provided to resist the overturning moment, the center of gravity of all projecting masonry or molded cornices, including loads thereon, shall lie within the middle third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of approved noncombustible material anchored in an approved manner.

## **SECTION 840.0. BEARING ON HOLLOW UNIT WALLS**

**840.1. Bearing Details.**— Concentrated loads shall be supported upon a solid construction of solid masonry, concrete, or masonry of hollow units with cells filled with mortar, grout, or concrete and of sufficient height to distribute safely the loads to the wall, pilaster, or column, or other adequate provisions shall be made to distribute the loads.

**840.1.1. Joist Bearing.**— Solid construction for support under joists shall be at least two and one-quarter (2-1/4) inches in height, and joists supported on such construction shall extend into the masonry at least three (3) inches.

**840.1.2. Beam Bearing.**— Solid construction for support under beams, girders, or other concentrated loads shall be at least four (4) inches in height and the bearing of beams shall extend into the masonry at least three (3) inches.

## **SECTION 841.0. PLAIN CONCRETE**

Plain concrete is concrete cast in place and not reinforced, or reinforced only for shrinkage or changes of temperature. Plain concrete shall be designed, mixed, placed and cured in accordance with the applicable requirements of section 843 for controlled concrete, or section 844 for ordinary concrete, as applicable, and reference standard RS 8-45 and RS 8-60. The building official shall require an applicant for a permit involving the structural use of concrete to have approved inspection personnel perform inspections or other quality control duties when such duties are required by this code.

**841.1. Limitations.**— Plain concrete in loadbearing masonry or where exposed to soil or where used for fire-resistive purposes, shall be of such proportions as to have a strength of at least fifteen hundred (1500) pounds per square inch and where exposed to wetting or freezing at least two thousand (2,000) pounds per square inch.

**841.2. Documentation.**—Shall conform to section 842.1.

**841.3. On Site Certification.**—Shall conform to section 842.2.

## **SECTION 842.0. REINFORCED CONCRETE**

Concrete materials, design, and construction shall meet the requirements of section 843 for controlled materials or of section 844 for ordinary materials, as applicable, and shall otherwise conform to reference standard RS 8-45. Precast concrete construction utilizing a thin skin or slab stiffened or supported by a system of ribs shall conform to the requirements of reference standard RS 8-63. The building official shall require an applicant for a permit involving the structural use of concrete to have approved inspection personnel perform inspections or other quality control duties when such duties are required by this code. The architect or engineer responsible for the design drawings as evidenced by his seal thereon shall prepare, supervise, or check said design working drawings and shop details for the construction.

**842.1. Documentation.**—All required attestations shall become a part of the documentation to be filed with the building official and shall be subject to verification by strength tests, as hereinafter described, by check sampling of ingredients, or by such other inspections as the building official or the architect or engineer responsible for the design drawings may elect. Where automatic or semi-automatic batching equipment is used, all recordable data including tapes, equipment readings, and truck tickets together with the required reports certifying the mix shall be available for inspection for a period of two (2) years.

**842.2. On Site Certification.**—Certification of concrete and concrete construction shall conform to the requirements of reference standard RS 8-60, and the provisions of this section.

**842.2.1.**—When elements and operations on elements which are required by reference standard RS 8-60 to be subject to certification, said certification shall include:

- a. **Strength Tests.**—Strength tests shall be performed on all structural concrete. The provisions of reference standard RS 8-45 shall apply. Test cylinders shall be made and stored on the job site in an insulated curing box of sufficient size and strength to contain the required number of cylinders and to minimize the hazard of disturbance during curing. The box shall be heated as

required to maintain proper curing conditions. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Cylinders shall remain in the curing box until ready for delivery to the testing laboratory but not less than twenty-four (24) hours. Actual preparation and testing of the cylinders shall be performed by competent individuals with demonstrated experience acceptable to the architect or engineer responsible for the design drawings and the building official and all concrete failing to meet the specified minimum strength requirements shall be rejected by said architect or engineer or building official pending verification of the adequacy of the construction by core testing in accordance with reference standard RS 8-68.

b. **Additional Tests.**—Each sample recovered for the purpose of strength tests shall be additionally checked for slump, air content, unit weight, and temperature in accordance with the standard procedures noted in reference standard RS 8-45.

c. **Forms, Reinforcement and Placing.**—The size and dimensions of the concrete members formed by the concrete forms; sizes and positions of reinforcement, in place; and the placement of concrete, including temperatures, protections against excessive temperatures, curing, the erection and connection of precast members, the amount of water added in the field; and tensioning of all prestressed elements shall be recorded and compliance with the provisions of this code shall be certified.

**842.2.2.**—When elements and operations on elements are not required by reference standard RS 8-60 to be subject to certification, quality control and inspection shall be provided in sufficient scope to assure conformance with the requirements of this section (and of the cited reference standards.)

**842.3. Embedded Mechanical Facilities.**—Plumbing and heating piping and electrical conduits may be embedded in reinforced concrete floor and wall construction and in column fireproofing as provided in section 914.3. Piping for radiant heating purposes may be embedded in the structural floor or wall slabs, or may be installed in a separate concrete layer placed in addition to the required fireproof covering, as approved by the building

official. In any case, the required area of reinforcement shall be provided in addition to such piping; and the conduits, pipes or other embedded mechanical facilities shall be so placed as to leave the strength and fireresistance of the construction undiminished. All embedment of mechanical facilities shall conform to reference standard RS 8-45.

### **SECTION 843.0. CONTROLLED CONCRETE**

When controlled materials procedure is followed in the design and construction of a concrete building or structure and certified in conformance with reference standard RS 8-60 the allowable working stresses shall conform to accepted engineering practice in accordance with the building code requirements for concrete listed in reference standard RS 8-45. The ultimate compressive strength of the concrete shall not be limited in controlled concrete procedure, provided proper provision is made to limit deflections and cracking.

### **SECTION 844.0. ORDINARY CONCRETE**

When ordinary material procedure is followed in the construction of a concrete building or structure and certified for compliance with reference standard RS 8-60 (if required thereby), the design shall conform to accepted engineering practice in accordance with building code requirements listed in reference standard RS 8-45. In no case shall the cement factor and water cement ratio violate the requirements of tables RS 8-45-1 or RS 8-45-2 of reference standard RS 8-45 nor shall the specified or required twenty-eight (28) day compressive strength ( $f'c$ ) exceed four thousand (4,000) psi.

### **SECTION 845.0. OMITTED**

### **SECTION 846.0. SHORT SPAN FLOOR FILLING**

For spans not exceeding ten (10) feet between steel flanges, the safe supporting capacity of concrete floor and roof slabs built as fireproof floor filling between steel beams shall be determined by the provisions of reference standard RS 8-45 or in accordance with the approved rules for stone and light weight aggregate concrete and other approved fireresistive floor filling.

## SECTION 847.0. CONCRETE-FILLED PIPE COLUMNS

Concrete-filled pipe columns shall be manufactured from standard, extra strong, or double extra strong steel pipe and tubing, filled with concrete. Pipe or tubing for such columns may have round, square, or rectangular cross sections.

Steel equal in quality to that described in reference standard RS 8-42 shall be used for pipe. Pipe shall be new and full size, shall be made by the seamless process or fully welded to develop equivalent strength. All pipe shall be mill tested and approved. Round pipe shall be standard weight or heavier. The wall thickness of square and rectangular pipe shall not be less than three-sixteenths (3/16) inch.

Filling shall be standard weight, machine-mixed, stone or gravel concrete and shall have a minimum compressive strength of thirty-five hundred (3,500) pounds per square inch when proportioned and tested by procedures described in reference standard RS 8-45. Concrete while being placed shall be compacted by a mechanical method which will ensure complete filling of the pipe with dense concrete of homogeneous quality.

Bases, caps, web ties, brackets and shear heads shall be of steel meeting the requirements listed in reference standard RS 8-42

**847.1. Design.**—The safe supporting capacity of concrete-filled pipe columns shall be computed in accordance with the approved rules or as determined by test, or as follows:

**847.1.1. Allowable Axial Loads.**—The axial load  $P_a$  shall not exceed that obtained from formulas found in reference standard RS 8-42, multiplied by the effective transformed area  $A_{tr}$  and with  $P_a$  substituted for  $F_a$  and  $r_{tr}^2$  substituted for  $r^2$ . The values of  $A_{tr}$  and  $r_{tr}^2$  shall be evaluated by

$$A_{tr} = A_s + \frac{A_c}{2n} \qquad r_{tr}^2 = \frac{I_s + \frac{I_c}{2n}}{A_{tr}}$$

in which

$A_s$  = area of the pipe and reinforcing steel

$A_c$  = area of the concrete filling

$I_c$  = moment of inertia of the concrete filling

$I_s$  = moment of inertia of steel pipe and reinforcing

$$n = \frac{E}{E_c} = \frac{E}{60,000 \sqrt{f'_c}} = \frac{483}{\sqrt{f'_c}}$$

$f'_c$  = concrete compressive strength, psi

**847.1.2. Induced Bending Moment.**—The computed bending moment in columns shall take account of the effect of the axial load on the deflection including the deflection induced by the axial load itself. This moment  $M_r$  may be approximated by

$$M_r = \frac{C_m M}{1 - \frac{P_c (K l / r_{tr})^2}{149,000,000 A_{tr}}}$$

in which  $C_m$  shall be evaluated in accordance with reference standard RS 8-42, with  $P_c$  substituted for  $f_a$  and  $P_a$  substituted for  $F_a$ .

$M$  = bending moment neglecting the effect of the axial load on the deflection

$P_c$  = applied axial load

At braced points  $M_r$  may be taken equal to  $M$ .

**847.1.3. Combined Bending and Axial Compression.**—Provided that no part of the concrete filling is stressed in tension, columns subjected to bending as well as axial load shall be so proportioned that

$$\frac{P_c}{P_a} + \frac{f_b}{21,000} \leq 1$$

in which  $f_b$  is the compressive bending stress based on the moment given by section 847.1.2 at the point under consideration. The above expression applies directly to columns flexed about one principal axis and to round columns. In the latter case moment acting about several axes shall be added vectorially and  $f_b$  obtained from the resultant moment. For square and rectangular columns the second (bending) term shall be treated as

$$\frac{f_{bx} + f_{by}}{21,000}$$

At braced points  $P_a$  in the above formula may be computed for

$$\frac{K l_b}{r_{tr}} = 0 \text{ and } C_m = 1.$$

**847.1.4. Combined Bending and Axial Compression with Net Tension.**—If bending is sufficient to cause net tension at some point in the concrete fill the column shall be so proportioned that

$$\frac{P_c}{P_b} + \frac{M_r - sP_c}{M_o} \leq 1$$

In the above

$$P_b = \frac{1}{\frac{1}{P_a} + \frac{1}{21,000A_{tr}}}$$

$$s = \text{kern distance for the uncracked section} = \frac{r_{tr}^2}{c}$$

$c$  = distance from centroid to extreme fiber

$M_o$  = allowable moment with  $P_c = 0$  which can be approximated as  $21,000S$  in which  $S$  is the section modulus of the pipe and reinforcing steel alone

The above expression applies to columns flexed about one principal axis and to round columns. In the latter case moments acting about several axes shall be added vectorially to obtain the resultant movement.

For square or rectangular columns with bending about both principal axes, the section shall be so proportioned that

$$\frac{P_c}{P_{b \min.}} + \frac{M_{rx} - s_x P_c}{M_{ox}} + \frac{M_{ry} - s_y P_c}{M_{oy}} \leq 1$$

where the subscripts  $x$  and  $y$  indicate that the quantity is computed with respect to the  $x$  or  $y$  axis independently and  $P_{b \min.}$  is the smaller of  $P_{bx}$  and  $P_{by}$ .

**847.2. Connections.**—All caps, base-plates and connections shall be of approved types and shall be positively attached to the shell and anchored to the concrete core. When the pipe is slotted to accommodate webs of brackets or other connections, the integrity of the shell shall be restored by welding to insure hooping action of the composite section. Such fixtures and their attachments to the pipe and reinforcement shall be such as to ensure that the allowable stresses, under the maximum conditions of loading, are not exceeded.

**847.3. Reinforcement.**—Longitudinal steel having a yield point approximating that of the pipe may be used to increase the strength of the columns. The steel reinforcement shall be in the



form of rods, structural shapes or pipe embedded in the concrete core with sufficient clearance to insure the composite action of the section, but not nearer than one (1) inch to the exterior steel shell. Such steel shall be new, straight and continuous for the entire length of the column with ends so detailed as to develop the computed stress. The ends of such steel shall be arranged for even bearing with the pipe and milled after filling if necessary to obtain uniform bearing. The strength of this reinforcement shall be calculated by adding its area to the area of the steel pipe and including it in the calculations.

**847.4. Fireresistive Protection.**—Pipe columns shall be of such size or so protected as to develop the required fireresistance ratings specified in section 221.1 table 2-1. When an outer steel shell is used to enclose the fireproof covering, it shall not be considered as either load bearing or as increasing the stiffness of the column section. The minimum diameter of pipe columns shall be four (4) inches except that in frame structures not exceeding three (3) stories or forty (40) feet in height, three (3) inch columns may be used in the basement and as secondary steel members.

**847.5. Approvals.**—Details of column connections and splices shall be designed and shop fabricated by approved methods and shall be tested in accordance with approved rules as required by the building official.

**847.6. Tests.**—Copies of sanctioned tests of filled pipe columns subjected to axial loads made in accordance with this section shall be filed with the building official for each size of column produced by a manufacturer. These tests shall be made on specimens the length of which approximates twenty-four (24) times the smallest outside dimension of the pipe. Tests shall be made in an approved laboratory. For acceptance the ratio of the test strength to  $P_a$  shall not be less than the factor of safety used as the denominator in Formula (1.5-1) from reference standard RS 8-42, excepting that in computing  $P_a$  for sanctioned tests  $n$  rather than  $2n$  shall be used.

**847.7. Identification.**—Columns shall be labeled with manufacturer's name and date of manufacture.

## SECTION 848.0. PNEUMATIC CONCRETE

Construction methods for mortar or concrete deposited pneumatically (shotcrete) shall conform to the applicable provisions of reference standard RS 8-52, and shall be protected and cured

to prevent the temperature falling below fifty (50) degrees F. and to prevent loss of moisture at the surface. Reinforcement for pneumatic mortar shall be adequate to meet structural requirements and shall consist of round bars or mesh not less than No. 12 U.S. gage in diameter, spaced not less than two (2) inches either way.

**848.1. General Requirements.**—Pneumatically placed concrete and mortar shall consist of a mixture of aggregate and cement pneumatically applied by suitable mechanism, and to which water is added immediately prior to discharge from the applicator for the dry mix or at a point removed from the applicator as in the wet mix. Except as specified in the following sections, pneumatically placed concrete shall conform to the requirements of this code for reinforced concrete.

**848.1.1. Proportions.**—The proportion of cement to aggregate, in loose dry volume, shall not be less than one (1) to four and one-half (4-1/2).

**848.1.2. Water.**—The water content at the time of discharge, including moisture in the aggregate, shall not exceed a water-cement ratio of 0.50 by weight.

**848.1.3. Mixing.**—The cement and aggregate shall be thoroughly mixed prior to the addition of water. At the time of mixing the aggregate shall contain not less than three (3) per cent moisture.

**848.2. Rebound.**—Any rebound or accumulated loose aggregate shall be removed from the surfaces to be covered prior to placing the initial or any succeeding layers of pneumatically placed concrete and mortar.

**848.3. Joints.**—Unfinished work shall not be allowed to stand for more than thirty (30) minutes unless all edges are sloped to a thin edge. Before placing additional material adjacent to previously applied work, these sloping edges shall be cleaned and wetted.

**848.4. Damage.**—Any pneumatically placed concrete which sags after placement shall be removed.

## **SECTION 849.0. MINIMUM CONCRETE DIMENSIONS**

The dimensions of reinforced concrete structural elements in buildings of fireproof (types 1A and 1B) construction shall be adequate to meet the fire and strength tests of this code. Any floor finish not placed monolithically with floor slabs, shall not be included in the calculations for structural strength, unless specifically approved by the building official.

**SECTION 850.0. REINFORCED GYPSUM CONCRETE**

Reinforced gypsum concrete for use in buildings and structures shall consist of a mixture of calcined gypsum and water, with or without the addition of wood chips, shavings, fiber or other approved aggregates. The manufacture, design, and construction of both poured in place and precast gypsum concrete shall comply with the requirements of reference standard RS 8-53.

**850.1. Limitations.**—Gypsum concrete shall not be used where exposed directly to the weather or where subject to frequent or continuous wetting. To prevent saturation or freezing, protection from the weather and from contact with moisture shall be furnished during shipment and storage of prefabricated units, and after erection or pouring at the site.

**850.1.1. Fire Protection.**—Fire protection coverage for steel reinforcement in gypsum shall be limited to a minimum of one-half (1/2) inch in thickness.

**850.1.2. Wearing Surface.**—In no case shall gypsum concrete be used for a wearing surface in gypsum construction.

**850.1.3. Prohibited Use in Floors.**—Gypsum concrete shall not be used in floors of garages, dance halls, gymnasiums, armories or floors used for any other purpose where subject to extreme vibration, impact, or heavy, moving load concentrations.

**850.1.4. Grade Construction.**—The ventilated space underneath first floor construction shall be not less than two (2) feet high and the underside of first floor construction shall be damp-proofed with an approved protective covering.

**850.2. Poured in Place Gypsum Concrete.**—The wood aggregates and gypsum shall be pre-mixed at the mill, requiring only the addition of water at the job or site.

**850.2.1. Reinforcing.**—Bundles or rolls of welded wire fabric shall be securely tagged so as to identify the type and grade of steel, and the size.

**850.3. Precast Gypsum Concrete.**—Precast gypsum concrete units may be used for floor construction and shall be of uniform thickness except for rabbets at support and shall be solid; such units may be used for roof construction and shall be of uniform thickness, whether solid or hollow, or recessed on the under side.

**850.3.1. Span.**—The span of precast gypsum concrete shall not exceed four (4) feet in floors and six (6) feet in roofs except in so-called suspension construction in which the span for floors shall not exceed six (6) feet and in roofs shall not exceed eight

(8) feet. For the purpose of this section any span over three (3) feet shall be called long span.

**850.3.2. Thickness.**—Except as otherwise provided in section 850.3.3, precast gypsum concrete units shall have not less than the following:

- a. Solid units in roofs shall be not less than two (2) inches thick, nor if long span, less than three (3) inches thick.
- b. Solid units in floors shall be not less than two and one half (2-1/2) inches thick, nor, if long span, less than four (4) inches thick.
- c. Hollow units in roofs shall be not less than three (3) inches nor the shell in compression less than three fourths (3/4) inch thick; if long span, the units shall be not less than five (5) inches thick nor the shell in compression less than one and three eighths (1-3/8) inches thick.
- d. Recessed units in roofs shall be not less than five (5) inches thick nor the panel less than one and three eighths (1-3/8) inches thick.

**850.3.3. Construction and Erection.**—Precast solid reinforced gypsum concrete units not more than fifteen (15) inches wide and bound on the long edges with structural or pressed sheet steel of approved design anchored to the units shall be not less than two (2) inches thick. If the length of units is not less than one and one half (1-1/2) times the span and the steel bearing on the edges is designed to interlock with adjoining units in the manner of tongue and groove, and if of sufficient strength to transmit the load on one unit to adjoining units, the end joints may be staggered at random provided they are not less than two (2) feet apart and the construction may be designed as continuous. Precast gypsum concrete units for floor and roof construction shall be reinforced and unless the shape or marking of the unit is such as to ensure its being placed right side up, the reinforcing shall be symmetrical so that the unit can support its load either side up. All units shall be metal bound or otherwise reinforced for handling stresses and precaution shall be observed to provide temporary anchorage to the structural frame during erection and to prevent damage or destruction from the weather and wind before final completion of the installation.

**850.3.4. Approvals.**—Precast gypsum concrete units shall not be used structurally in floors or roofs until the manufacturer thereof has submitted satisfactory evidence of their quality and the building official has given his approval. Approval shall be

conditioned upon such requirements as to design, materials, methods of manufacture, erection and support as the building official shall determine.

**850.3.5. Test Cylinders.**—Not less than three (3) compression specimens for each one hundred (100) yards of gypsum concrete cured and stored under the same conditions as the prefabricated member shall be tested at the age of shipment. The test specimens shall develop an average compressive strength at the time of shipment not less than twice the stress used in the design.

## **SECTION 851.0. REINFORCED BRICKWORK**

All systems of brick masonry reinforced with steel in grouted mortar joints for use in the design and construction of buildings and structures shall conform to the requirements of this section and reference standard RS 8-58. Reinforced brickwork shall incorporate only controlled materials and be certified in conformance with reference standard RS 8-60.

**851.1. Design.**—The formulae and assumptions used in the design of reinforced masonry shall be those contained in reference standard RS 8-58.

**851.2. Foundation Piers.**—Minimum dimensions for reinforced brick used as a foundation pier shall be as required by section 749.4.

## **SECTION 852.0. REINFORCED HOLLOW BLOCK CONSTRUCTION**

Walls constructed of hollow block or other hollow unit masonry and reinforced with steel rods grouted solidly into certain vertical cells and horizontal beams shall be designed and constructed in accordance with reference standard RS 8-50. Reinforced concrete masonry shall incorporate only controlled materials and shall be certified in conformance with reference standard RS 8-60.

## **SECTION 853.0. LUMBER AND TIMBER CONSTRUCTION**

**853.1. Design.**—Structural lumber and timber and its fastenings shall be adequately designed and assembled to safely sustain all imposed loads. When stress-grade lumber is used and properly identified and controlled, working stresses may be in accordance

with the accepted engineering practice standards in reference standard RS 8-76. All lumber used for load supporting purposes shall be identified by the grade mark of a lumber grading inspection agency approved by the building official. Grading practices and identification shall be in accordance with rules published by an agency recognized as being competent. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency approved by the building official may be accepted for precut, remanufactured, or rough sawn lumber; also for sizes larger than three (3) inches nominal thickness.

## **853.2. Minimum Dimensions.**

**853.2.1. Sizes of Structural Members.**—All lumber sizes specified in this code are nominal sizes. Nominal sizes may be shown on the plans. Computations to determine the required size of members shall be based on the net dimensions (actual sizes).

**853.2.2. Structural Posts.**—All isolated structural posts shall have a minimum dimension of four (4) inches:

## **853.3. Fabrication.**

**853.3.1. Connections.**—All connections shall be fabricated with approved timber connectors, bolts, lag screws, spikes, nails or gluing or other approved connecting devices in accordance with reference standard RS 8-76. Bolted connections shall be snugged up tightly without crushing wood fibers under the washers. All nailed connections shall meet the minimum requirements of reference standard RS 8-77.

**853.3.2. Cambering.**—Trusses and long span girders shall be designed with a camber or other provisions to provide for possible deflections.

**853.3.3. Cutting and Notching.**—It shall be unlawful to notch, cut or pierce wood beams, joists, rafters or studs in excess of the limitations herein specified unless proven safe by structural analysis, or suitably reinforced to transmit all calculated loads. Notches in the top or bottom of joists shall not exceed one-sixth ( $1/6$ ) the depth of the member and shall not be located in the middle one-third ( $1/3$ ) of the span. Notches located closer to the supports than three (3) times the depth of the member shall not exceed one-fifth ( $1/5$ ) the depth. Holes bored or cut into joists for piping or electrical cables shall not be closer than two (2) inches to the top or bottom of the joist and the diameter of the hole shall not exceed one-third ( $1/3$ ) the depth of

the joist. In studs of bearing walls or partitions, notches or bored holes made to receive piping, electrical conduit, air conditioning or heating duct work or for other fabricating purposes shall not be cut or bored more than one-third ( $1/3$ ) the depth of the stud. When the stud is cut or bored in excess of one-third ( $1/3$ ) its depth it shall be reinforced to be equal in load carrying capacity to a stud notched not more than one-third ( $1/3$ ) its depth.

**853.4. Trimmer and Header Beams.**—When determined necessary by stress analysis, trimmer and header beams shall be hung in approved metal or other approved non-combustible stirrups or hangers, unless supported on a masonry wall or girder. All such beams shall be spiked together.

**853.5. Bearing and Anchorage on Girders.**—All members framing into girders shall be anchored or tied to secure continuity. The ends of all wood beams or joists resting on girders shall bear not less than four (4) inches or shall be supported in approved metal stirrups, hangers, or on wood clips or ribbon strips. Beams framing from opposite sides shall lap at least six (6) inches and be bolted or spiked together; and when framing end to end, they shall be secured together by metal ties, straps or dogs.

**853.6. Maintenance.**—All connections in the joints of timber trusses and structural frames shall be inspected periodically and bolts and other connectors shall be maintained tight.

## **SECTION 854.0. HEAVY TIMBER TYPE CONSTRUCTION**

**854.1. Wood.**—All structural wood members sawn or glued laminated used in heavy timber type construction shall be stress-grade timbers identified as to grade and strength by approved authoritative manufacturing, testing or inspection agencies or bureaus. All structural timber members shall have the minimum dimensions specified in section 217 for type 3-A construction.

**854.2. Other Structural Materials.**—Structural steel or reinforced concrete members may be substituted for timber in any part of the structural frame, protected to develop the required fire-resistance specified in section 221.1 table 2-1, but not less than three-quarter ( $3/4$ ) hour fireresistance. Structural members supporting walls shall be protected to afford the same fireresistance rating as the wall supported.

**854.3. Columns.**—Columns shall be continuous or superimposed throughout all stories by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed

steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by means of metal connectors housed within the contact faces or by other approved methods. Girders or trusses supporting columns shall have at least three-quarter ( $3/4$ ) hour fire-resistance.

**854.4. Floors.**—The planks shall be laid so that no continuous line of joints will occur except at points of support and so that they are not spiked to supporting girders. Flooring shall not extend closer than one-half ( $1/2$ ) inch to walls to provide an expansion joint, but the joint shall be covered at top or bottom to avoid flue action.

**854.5. Beams and Girders.**

**854.5.1. Wall and Girder Supports.**—Wall plate boxes of self-releasing type or approved hangers shall be provided where beams and girders enter masonry. An air space of one-half ( $1/2$ ) inch shall be provided at the top, end and sides of the member unless approved durable or treated wood is used. Where intermediate beams are used to support a floor, they shall rest on top of the girders, or shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be closely fitted. Wood beams and girders supported by walls required to have a fire-resistance rating of two (2) hours or more shall have not less than four (4) inches of solid masonry between their ends and the outside face of the wall and between adjacent beams. Adequate roof anchorage shall be provided.

## **SECTION 855.0. WOOD FRAME CONSTRUCTION**

The exterior walls, interior partitions, floors and roofs of wood frame construction shall be designed, braced and constructed to develop adequate strength and rigidity to resist all vertical and lateral forces due to both dead and live loads without exceeding the stresses allowed in this section for the various grades and species of wood. Standard balloon, braced, platform, and post and beam types of construction shall be acceptable framing methods. Sizes of wood members stated in this section are nominal sizes, materials, design, and construction methods shall meet the requirements in those applicable sections of reference standard RS 8-76.

**855.1. Wood—Stud Frame.**

**855.1.1. Bearing Walls.**—Posts and studs in bearing walls and



partitions shall be designed as columns, with due allowance for lateral support furnished by sheathing, intermediate bracing, horizontal bridging, wall coverings and the floor and roof assemblies. The walls shall be fabricated in such a manner as to provide adequate support for the material used to enclose the building and to provide for transfer of all lateral loads to the foundation, in accordance with section 804.3.

**855.1.2. Non-Bearing Walls.**—Studs in non-bearing walls and partitions shall not be spaced more than forty-eight (48) inches on centers unless otherwise approved after test as an integrated assembly, and may be erected with the long dimension parallel to the wall.

**855.1.3. Bracing.**—In buildings more than one (1) story in height and where necessary for strength in one (1) story buildings, the corner posts shall be the equivalent of not less than three (3) pieces of two (2) by four (4) inch studs, braced by not less than one (1) piece of one (1) by four (4) inch continuous diagonal brace let into the studs and into top and bottom plates or by other approved methods. Bracing may be omitted when diagonal wood sheathing or plywood panels are used, or other sheathing specified in section 855.2 is applied vertically in panels of not less than four (4) feet by eight (8) feet in area with approved nailing complying with reference standard RS 8-77. Ledger or ribbon boards used to support joists shall be not less than one (1) by four (4) inches in size, cut into and securely nailed to each stud.

**855.1.4. Mortise and Tenon Framing.**—Where mortise and tenon framing is used, the vertical members of the frame shall be not less than four (4) by six (6) inches in size and shall be designed as a column.

**855.1.5. Multiple Stories.**—When the frame is more than one (1) story in height and studs and posts are not continuous from sill to roof, the members shall be secured together with approved clips, splices or other connections to insure a continuous, well integrated structure. Sheet metal clamps, ties or clips shall be formed of galvanized steel or other approved corrosion-resistive materials equivalent to No. 20 U.S. gage steel sheets for two (2) inch framing members and not less than No. 18 U.S. gage for three (3) inch structural members. For four (4) inch and larger members, column splices and beam and girder supports shall comply with section 854.

**855.1.6. Framing Over Openings.**— Headers, double joists, trusses or other approved assemblies of adequate size to transfer all superimposed loads to the vertical member shall be provided over all window and door openings in bearing walls and partitions.

**855.1.7. Empirical Provisions in Lieu of Design.**— The provisions of this section may be used in lieu of structural analysis only for those buildings in occupancy group L-3 where the specific occupancies correspond to a live load requirement of forty (40) psf or less. Refer to reference standard RS 8-78 for these provisions.

**855.2. Wall Sheathing.**— Except as provided in section 855.3 for weather boarding or when stucco construction complying with section 821.5 is used, all enclosed buildings shall be sheathed with one of the materials of the following nominal thickness or any other material of equal strength and durability approved by the building official:

Reinforced cement mortar . . . . .	1 inch
Wood sheathing. . . . .	1 inch
Plywood. . . . .	5/16 inch
Gypsum sheathing . . . . .	1/2 inch
Fiber boards . . . . .	1/2 inch

**855.2.1. Paper-Backed Lath Sheathing.**— In one- and two-family dwellings and one (1) story commercial buildings with brick or similar veneers the sheathing may consist of a layer of paper-backed lath complying with section 821.4 with a one (1) inch intermediate space which shall be mortar filled as each course of veneering is applied.

**855.3. Exterior Weather Boarding, Veneers and Condensation.**— To secure weather-tightness in framed walls and other unoccupied spaces, the exterior walls shall be faced with an approved weather-resisting covering properly attached to resist wind and rain. The cellular spaces shall be so ventilated as not to vitiate the firestopping at floor, attic and roof levels or shall be provided with interior non-corrodible vapor-type barriers complying with the approved rules; or other means shall be used to avoid condensation and leakage of moisture. The following materials shall be acceptable as approved weather coverings of the nominal thickness specified:

Brick Masonry veneers . . . . .	2 inches
Stone veneers. . . . .	2 inches
Clay tile veneers. . . . .	1/4 to 1 inch
Stucco or exterior plaster . . . . .	3/4 inch

Precast stone facing . . . . .	5/8 inch
Wood siding (without sheathing) . . . . .	5/8 inch
Wood siding (with sheathing) . . . . .	1/2 inch
Protected fiber board siding . . . . .	1/2 inch
Wood shingles . . . . .	3/8 inch
Exterior plywood (without sheathing) . . . . .	See sec. 825.2
Exterior plywood (with sheathing) . . . . .	5/16 inch
Asbestos shingles . . . . .	5/32 inch
Asbestos cement boards . . . . .	1/8 inch
Aluminum clapboard siding . . . . .	.024 inch
Formed steel siding . . . . .	29 gage
Hardboard siding . . . . .	1/4 inch

**855.3.1. Masonry Veneers.**—Refer to section 863.3.1.

**855.3.2. Metal Veneers.**—Veneers of metal shall be fabricated from approved corrosion-resistive materials or shall be protected front and back with porcelain enamel or shall be otherwise treated to render the metal resistant to corrosion. Such veneers shall be not less than No. 29 gage in thickness mounted on wood or metal furring strips or approved sheathing on the frame construction.

**855.3.3. Height of Veneers.**—Refer to sections 863.2 and 863.3.1.

**855.3.4. Nailing.**—All weatherboarding and wall and roof coverings shall be securely nailed with aluminum, copper, zinc, zinc-coated or other approved corrosion-resistive nails in accordance with reference standard RS 8-77 or the approved manufacturer's standards.

Shingles and other weather coverings shall be attached with appropriate standard shingle nails to furring strips securely nailed to studs, or with approved mechanically-bonding nails except when sheathing is wood not less than one (1) inch nominal thickness or plywood not less than five-sixteenths (5/16) inch thick.

Wood shingles or shakes attached with approved corrosion-resistive annular grooved nails may be applied over fiberboard shingle backer and fiberboard sheathing when the installation is in accordance with the approved manufacturer's standards. Wood shingles or shakes and asbestos shingles or siding may be nailed directly to nail base fiberboard sheathing not less than one-half (1/2) inch nominal thickness with approved corrosion-resistive annular grooved nails when the installation is in accordance with the approved manufacturer's standards.

**855.4. Foundation Anchorage.**—When required to resist wind uplift or lateral forces as determined in conjunction with article 7, wall sills shall be anchored to the foundation walls or piers at corners and at intermediate intervals of not more than eight (8) feet with properly anchored one-half (1/2) inch bolts. Sill plates shall be at least equivalent to a two (2) by six (6) inch member.

**855.5. At-Grade Protection.**

**855.5.1. Wood Framing.**—All exterior wood framework of buildings whether structural or non-loadbearing shall be supported on approved foundation walls at least eight (8) inches above the finished grade.

**855.5.2. Metal Siding.**—Exposed metal siding or sheathing shall be protected from corrosion at the ground level by supporting the foundation channel at sufficient height above grade on the concrete apron or other approved water-resisting foundation.

**855.6. Floors.**

**855.6.1. Bridging.**—Except as hereinafter noted, in all floor, attic and roof framing, there shall be not less than one (1) line of bridging for each eight (8) feet of span. The bridging shall consist of not less than one (1) by three (3) inch lumber, double-nailed at each end, or of equivalent metal bracing of equal rigidity. A line of bridging shall also be required at supports where adequate lateral support is not otherwise provided.

**855.6.2. Flooring.**—The flooring of wood frame construction shall be of adequate strength and stiffness to support required loads and, where necessary for strength and for lateral support of the building, subflooring shall be provided.

**855.7. Roofs.**

**855.7.1. Types of Decking and Sheathing.**—Roof deck sheathing shall consist of not less than one (1) inch boards or plywood of the thickness specified in section 825.3, or other approved materials of equivalent strength and rigidity. When open-deck sheathing is used on pitched roofs, it shall consist of not less than one (1) by four (4) inch roofers spaced not more than six (6) inches on centers or material of equivalent strength and rigidity.

**855.7.2. Wood Shingles.**—Wood shingles and handsplit shakes complying with reference standard RS 8-79 may be used for roof covering where permitted in section 928.3, and may be installed on tight decking or on spaced roof boards.

**855.8. Flashing.**—Approved corrosion-resistive flashing shall be provided at top and sides of all exterior window and door

openings in such manner as to be leakproof. Similar flashings shall be installed at the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings; under and at the ends of masonry, wood or metal copings and sills; continuously above all projecting wood trim; at wall and roof intersections; under built-in gutters; at a junction of chimneys and roofs; in all roof valleys and around all roof openings. When veneers of natural or artificial stone are used, fourteen (14) pounds felt or paper shall be attached to the sheathing with flashing wherever necessary to prevent moisture penetration behind the veneer.

**855.9. Interior Finish.**—In all habitable spaces, interior wall and partition surfaces shall be finished with materials which do not exceed the combustible limitations of section 904.0 and are of adequate strength to resist a horizontal force of not less than five (5) pounds per square foot.

## **SECTION 856.0. STRESS SKIN PANELS**

**856.1. Integrated Assemblies.**—Approved panels or other integrated assemblies fabricated of dimension lumber with wood stress-coverings glued thereto, or consisting of structural units of metal-covered or molded plywood or other approved plastics, formed and molded into prefabricated loadbearing members shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with reference standard RS 8-54, or meeting the test requirements of sections 803, 804, and 805.

**856.2. Splices.**—Splices and connections between panels shall be weathertight and of sufficient strength to resist two and one-half (2-1/2) times the design live load to which they will be subjected in normal use. The fastenings of covering assemblies to structural studs, ribs or joists shall provide rigidity equivalent to approved gluing. Nailing shall not be acceptable for that purpose.

**856.3. Molded Plywood Units.**—Structural units of plywood or other approved plastics of similar combustible characteristics formed and molded into prefabricated load-bearing members shall conform to the approved rules and shall be identified by the approved label. The design shall be based on approved engineering analysis confirmed by the tests prescribed in sections 803 and 804.

## **SECTION 857.0. STRUCTURAL GLUED LAMINATED TIMBER AND BUILT-UP LUMBER CONSTRUCTION**

Buildings and structures may be designed and erected of glued laminated structural members of standard commercial or stress grade lumber, or of composite members of plywood and dimension lumber.

**857.1. Structural Glued Laminated Timber.**—Structural glued laminated timber shall be manufactured and constructed under the controlled material procedure to meet the requirements of reference standards RS 8-55 and RS 8-56. Structural design shall be in accordance with reference standard RS 8-51 or with other approved engineering standards.

**857.2. Glued Lumber Members.**—Built-up beam and column sections consisting of one or more webs with glued lumber flanges and stiffeners, shall be designed in accordance with approved engineering analysis.

**857.2.1. Gluing Surfaces.**—In glued lumber constructions, the surfaces shall be worked to a smooth, flat surface without sanding and free from wax, grease or oil to insure a complete glue bond over the entire contact. Factory sanded plywood shall not be prohibited.

**857.3. Mechanically Laminated Members.**—Mechanically laminated members shall be designed and constructed in accordance with reference standard RS 8-76.

**BUILDING ENCLOSURES, WALLS AND WALL THICKNESS**

859.0	Enclosure Walls	871.0	Foundation Walls
860.0	Protection of Wall Openings	872.0	Retaining Walls
861.0	Fire Access Panels	873.0	Isolated Piers
862.0	Structural Glass Block Walls	874.0	Waterproofing
863.0	Wall Veneers	875.0	Ratproofing
864.0	Structural Glass Veneers	876.0	Protection Against Decay and Termites
865.0	Thin Stone and Tile Veneers	877.0	Fire Protection and Fire-stopping
866.0	Metal Veneers	878.0	Thermal Insulating Materials
867.0	Plastic Veneers		
868.0	Thickness of Solid Masonry Walls	RS 8	Reference Standards
869.0	Thickness of Panel Walls		
870.0	Parapet Walls		

**TABLES**

- 8-2 859.5.9.1. Requirements for Glass Panels Subject to Impact Loads
- 8-3 863.2.1. Minimum Thickness of Veneer
- 8-4 871.2.2.a Thickness of Foundation Walls.

**SECTION 859.0. ENCLOSURE WALLS**

All buildings, except as may be provided for miscellaneous structures designed for special uses, shall be enclosed on all sides with independent or party walls or frame, masonry or other approved construction. Such walls shall be constructed to afford the fireresistance specified in section 221.1 table 2-1 as otherwise required in this code.

**859.1. Projections.** — Exterior enclosure walls shall be constructed entirely within property lines or building lines when established by law, except for authorized projections beyond the street lot line in accordance with the provisions of section 312.

**859.2. Exterior Wall Pockets.** — In exterior walls of all buildings and structures, wall pockets or crevices in which moisture may accumulate shall be avoided or protected with adequate caps or drips, or other approved means shall be provided to prevent water damage.

**859.3. Gutters and Coping.** — Unless constructed with parapet walls and coping as required by section 870 whereby provision

would be made for interior drains, all exterior walls shall be provided with gutters and downspouts or leaders to dispose of roof drainage in compliance with article 17. Exceptions may be made for:

- a. Roofs with overhangs greater than twelve (12) inches in width for one (1) story or twenty-four (24) inches in width for two (2) story, and
- b. One (1) and two (2) story buildings not over six hundred and fifty (650) square feet in area.

Roofs of buildings and of all parts thereof shall be sloped to drain at a pitch of not less than one (1) inch in ten (10) feet. Means shall be provided to prevent rain water from any part of a building except window sills, copings and cornices not more than one (1) foot wide and awnings or marqueises discharging off the outer edge, from filling or flowing upon a public way.

**859.4. Exceptions.**—The provisions of this article shall not be deemed to prohibit the omission of exterior walls for all or part of a story of a building in accordance with the provisions of section 906.1.

**859.5. Glass in Walls.**

**859.5.1. Scope.**—The provisions of sections 859.5.2 through 859.5.5 shall apply to the use of glass in the exterior wall of a building and shall be limited to exterior application wherein the glass would not be subjected to any loads normal to the face of glass other than those due to wind. For applications involving human impact, the provisions of section 859.5.9 shall apply. For other cases, the strength and mode of installation of glass shall be approved by the building official.

**859.5.2. Support for Glass Panels.**—Glass shall be firmly held in place. The supports shall be of adequate strength to resist the applicable design wind loads as prescribed in article 7.

**859.5.3. Glass Requirements.**—Unless otherwise stated herein, glass shall meet the requirements of reference standard RS 8-59 for the applicable type, size, thickness and quality.

**859.5.4. Thickness of Glass.**—Thicknesses of glass panels shall be chosen as required by reference standard RS 7-6 and article 7.

**859.5.5. Installation of Glass Panels.**—Glass panels shall be handled and installed so that their strength is not impaired by chipping or scratching, shall be fully and firmly bedded in their supports, and shall be mounted in a manner that will accommo-



date differential movements due to thermal and loading conditions.

**859.5.6. Protection of Glass Panels.**—Glass panels installed in areas where they will be subject to unusual conditions of construction damage, such as spatter from welds or locations near materials hoists, shall be protected by a hardboard covering or its equivalent during the period that such work is in progress.

**859.5.7. Deflection of Support.**—The deflection of members supporting glass panels under the design wind load (measured perpendicular to the plane of the panel) shall not exceed  $L/175$ , where  $L$  is the span of the supporting member. In no case shall such deflection exceed three-quarter ( $3/4$ ) inch.

**859.5.8. Jalousies.**—In jalousie windows and doors regular plate, float, sheet or rolled glass thickness shall be not less than three-sixteenths ( $3/16$ ) inch; glass length shall not be more than forty-eight (48) inches; glass edges shall be smooth. Other types of glass may be used if approved by the building official.

**859.5.9. Panels Subject to Human Impact Loads.**—Glass in prime and storm doors, interior doors, fixed glass panels that may be mistaken for means of egress or ingress, shower doors and tub enclosures, or in similar installations wherein one (1) or more of the following criteria apply, shall meet the requirements set forth in section 859.5.9.1. table 8-2 or by comparative tests, shall be proven to produce equivalent performance:

- a. Openings are located in regularly occupied spaces.
- b. Lowest point of panel is less than eighteen (18) inches above finished floor.
- c. Minimum dimension of panel is larger than eighteen (18) inches.

### 859.5.9.1. Table 8-2

## Requirements for Glass Panels Subject to Impact Loads<sup>1,2</sup>

Glass Type	Individual Opening Area	Requirements
Regular plate, sheet or rolled (annealed)	Over 6 sq. ft.	Not less than 3/16 in. thick. Must be protected by a push-bar or protective grille firmly attached on each exposed side <sup>3</sup> , if not divided by a muntin.
Regular plate, sheet or rolled (annealed) surface sandblasted, etched, or otherwise depreciated	Over 6 sq. ft.	Not less than 7/32 in. thick. Must be protected by a push-bar or protective grille firmly attached on each exposed side <sup>3</sup> .
Regular plate, sheet or rolled (annealed) obscure	Over 6 sq. ft.	Not less than 3/16 in. thick. Must be protected by a push-bar or grille firmly attached on each exposed side <sup>3</sup> .
Laminated	Over 6 sq. ft.	Not less than 1/4 in. thick. Shall pass impact test requirements of reference standard RS 8-75.
Fully-tempered	Over 6 sq. ft.	Shall pass impact test requirements of reference standard RS 8-75.
Wired	Over 6 sq. ft.	Not less than 7/32 in. thick. Shall pass impact test requirements of reference standard RS 8-75.
All unframed glass doors (swinging)		Shall be fully-tempered glass and pass impact test requirements of reference standard RS 8-75.

### NOTES:

- 1 Glass less than single strength (SS) in thickness shall not be used.
- 2 If short dimension is larger than twenty-four (24) inches, glass must be double strength (DS) or thicker.
- 3 Building owners and tenants shall maintain push-bars or protective grilles in safe condition at all times.

## SECTION 860.0. PROTECTION OF WALL OPENINGS

**860.1. Fire-Protected Openings.**—Openings in exterior walls when required to be fire-protected shall comply with the provisions of article 9.

**860.2. Area of Openings.**—All openings facing on a street, yard, court, or public space which are required for light and ventilation shall comply with the provisions of article 5.

**860.3. Structural Strength.**

**860.3.1. Against Wind Forces.**—In all buildings required to resist wind pressure under the provisions of article 7, exterior window openings shall be designed to resist the specified wind load.

**860.3.2. Sash or Frames.**—The glass or other approved glazing material and when used, metal frames or other reinforcement, shall be adequate to resist the wind loads specified in article 7 blowing both inwardly and outwardly.

## SECTION 861.0. FIRE ACCESS PANELS

Completely enclosed buildings, without exterior openings in the enclosure walls, or without ready access for the purpose of fighting fire, shall be provided with access panels as required herein.

Access panels shall be not less than thirty-two (32) inches by forty-eight (48) inches in size.

When required to be fireresistive, access panels shall be equipped with approved opening protectives, complying with article 9, which are readily openable from both the outside and the inside.

**861.1. Multi-Story Buildings.**—In all exterior walls of the building required to have thirty (30) foot wide open space adjacent thereto (see sections 307.1 and 308.1) each floor below a height of one hundred (100) feet shall be provided with access panels spaced not more than fifty (50) feet apart in each story.

**861.2. Single-Story Buildings.**—In one (1) story buildings, not more than eighty-five (85) feet in height:

- a. Roof vents shall be provided, spaced not more than one hundred twenty-five (125) feet apart; and
- b. Grade level doors, or fire access panels shall be provided spaced not more than one-hundred (100) feet apart in all exterior walls of the building required to have thirty (30)

foot wide open space adjacent thereto (see sections 307.1 and 308.1).

**861.3. Construction of Access Panels.**— Access panels:

- a. Shall have a sill height of not more than thirty-six (36) inches; and
- b. Shall be readily identifiable from the outside, and;
- c. Shall be readily openable from the outside or shall be glazed with plain flat glass.

**861.4. Location.**— Wherever practicable, one access opening in each story shall provide access to a stairway, or where there is no stairway at the exterior wall, one access opening in each story shall be located as close as practicable to a stairway.

**861.5. Exemptions.**— The provisions of this article shall not apply to any story that is completely protected by an automatic sprinkler system conforming to the construction requirements of article 12.

## **SECTION 862.0. STRUCTURAL GLASS BLOCK WALLS**

Masonry of glass blocks may be used in non-loadbearing exterior or interior walls and in openings that might otherwise be filled with windows, either isolated or in continuous bands, provided the glass block panels have a thickness of at least three and one-half (3-1/2) inches, at the mortar joint and the mortared surfaces of the blocks are satisfactorily treated for mortar bonding.

**862.1. Exterior Wall Panels.**— The maximum dimensions of glass block wall panels in exterior walls when used singly or in multiples forming continuous bands of structural glass blocks between structural supports shall be twenty-five (25) feet in length and twenty (20) feet in height between structural supports and expansion joints; and the area of each individual panel shall be not more than two hundred and fifty (250) square feet. Intermediate structural supports shall be provided to support the dead load of the wall and all other superimposed loads. When individual panels are more than one hundred and forty-four (144) square feet in area a supplementary stiffener shall be provided behind the panels, anchored thereto and to the structural supports. Panels shall be set in recesses at the jambs and panels exceeding ten (10) feet in horizontal dimension between supports shall be set in recesses at the head so as to provide a bearing surface at least one (1) inch wide along the panel edges.

**862.2. Joint Materials.**—Glass blocks shall be laid up in type S or N mortar with approved galvanized or other non-corrosive metal wall ties in the horizontal mortar joints of exterior panels. The sills of glass block panels shall be coated with approved asphaltic emulsion, or other elastic waterproofing material previous to laying the first mortar course and the perimeter of the panels shall be caulked to a depth of not less than one-half ( $1/2$ ) inch with nonhardening caulking compound on both faces; or other approved expansion joints shall be provided. When laid up in joint materials other than mortars herein defined, no single panel shall be more than one hundred (100) square feet in area nor more than ten (10) feet in either length or height. Both vertical and horizontal mortar joints shall be at least one-fourth ( $1/4$ ) inch and not more than three-eighths ( $3/8$ ) inch thick and shall be completely filled.

**862.3. Wind Loads.**—Exterior wall panels shall be held in place in the wall opening to resist both the internal and external pressures due to wind specified in sections 713 and 714.

**862.4. Interior Wall Panels.**—Structural glass blocks shall not be used in fire walls or party walls or for load-bearing construction. Blocks in interior walls shall be erected with mortar in metal frames or reinforcement as provided in this section for exterior walls or other approved joint materials, except that wood strip framing may be used in partitions not required to be fire-resistive. For interior walls, glass block panels shall not exceed two hundred fifty (250) square feet of unsupported area nor twenty-five (25) feet in one direction between supports.

**862.5. Fire-resistance Rating.**—Nothing herein contained shall be construed to prohibit the use of glass blocks in an opening protective assembly or nonbearing partition or wall when required to afford a specific fire-resistance, provided approval of the building official is secured after satisfactory time-temperature performance under the prescribed test procedure of article 9.

**862.6. Access Panels.**—Access panels shall be provided in exterior glass block walls for fire department use to comply with section 861.

**862.7. Reinforcement.**—Glass block panels shall have approved reinforcement in the horizontal mortar joints, extending from end to end of mortar joints but not across expansion joints, with any unavoidable joints spliced by lapping the reinforcement not less than six (6) inches. The reinforcement shall be spaced at not more than two (2) feet vertically. In addition, reinforce-

ment shall be placed in the joint immediately above and below all openings within a panel.

**862.8. Expansion Joints.**—Every exterior glass block panel shall be provided with expansion joints at the sides and top. Expansion joints shall be entirely free of mortar, and shall be filled with resilient material.

## **SECTION 863.0. WALL VENEERS**

Veneer as used in this section refers to an exposed facing wythe or brick, tile, ceramic, terra cotta, concrete masonry units, cast stone, precast concrete, natural stone, or other weather-resistant noncombustible units securely attached to a surface for the purpose of providing ornamentation, protection or insulation, but not intentionally so bonded as to exert common action under load.

**863.1. Backing Surfaces for Veneers.**—Veneers for other than frame buildings, shall be attached only to substantial, rigid, noncombustible surfaces which are plumb, straight and of true plane; and no wood backing surfaces shall be used except in frame construction. The backing shall provide sufficient rigidity, stability and weather resistance; and the veneer shall be installed and anchored as required in this code for the specific material.

**863.2. Limitations.**—Veneer shall not be assumed to add to the strength of any wall, nor shall it be assumed to support any load other than its own weight. No veneer shall be less than the thicknesses specified in the following table. The height and length of veneer areas shall be unlimited, except as required to control expansion and contraction.

### **863.2.1. Table 8-3**

#### **Minimum Thickness of Veneer**

Ceramic veneer (architectural terra cotta—anchored type)	1 inch
Brick . . . . .	2 inches
Stone (natural) . . . . .	2 inches
Stone (cast artificial) . . . . .	1-1/2 inches
Clay tile (structural) . . . . .	1-3/4 inches
Clay tile (flat slab) . . . . .	1/4 to 1 inch
Marble slabs . . . . .	1 inch
Precast Stone Facing . . . . .	5/8 inch
Structural Glass . . . . .	11/32 inch
Aluminum Clapboard Siding . . . . .	.024 inch
Metal (approved corrosion-resistive) . . . . .	29 U.S. gage
Aluminum . . . . .	.03 inch

**863.3. Design.**—All anchor attachments shall be designed to resist a positive or negative horizontal force of thirty (30) psf, and adhesion type veneer shall be designed to have a bond sufficient to withstand a shearing stress of fifty (50) psi. In lieu of design, veneer may be installed in accordance with the requirements of sections 863.3.1. and 863.3.2.

**863.3.1. Veneer on Wood.**—Anchored masonry veneer attached to wood frame structures shall be supported on footings or foundation walls. Where anchored veneer exceeding twenty (20) feet in height is applied, it shall be supported in a manner that will provide for movement between the veneer and its backing. Veneer of unit masonry shall be attached directly to wood studs, by one of the following means:

- a. With at least twenty-two (22) gage corrosion-resistance corrugated steel ties at least seven-eighths ( $7/8$ ) inch wide at vertical intervals of not more than twenty-four (24) inches and horizontal intervals of not more than thirty-two (32) inches, but in no case less than one (1) tie for each three and one-half ( $3-1/2$ ) square feet of wall area.
- b. Directly to a one (1) inch reinforced cement mortar base.

**863.3.2. Veneer on Masonry.**—Veneer attached to masonry or concrete backing shall not be limited in height other than by compressive stresses. Veneer shall be securely attached to the masonry or concrete backing by one of the following means or by a means that is equivalent in strength:

- a. Metal ties conforming to section 836.0.2 except that ties shall be spaced not more than twenty-four (24) inches apart either horizontally or vertically.
- b. Corrosion-resistant dovetail slot anchors where the backing and the veneer have been designed for this type of attachment. Such anchors shall be formed from at least sixteen (16) gage steel at least one (1) inch wide.
- c. Adhesion type masonry veneer shall be installed in accordance with the manufacturer's recommendations and setting plans.
- d. Where anchored veneer is not grouted to the backing, it shall be supported in a manner that will provide for movement between the veneer and its backing.

**863.4. Support.**—The weight of all anchored type veneer shall be supported upon footings, foundation walls, or other supports without dependence upon anchors for vertical support. Veneer above openings shall be supported upon lintels.

## SECTION 864.0. STRUCTURAL GLASS VENEERS

**864.1. Dimensions.**—The minimum thickness of glass veneer shall be eleven thirty-seconds ( $11/32$ ) inch and the area of individual panels shall not exceed ten (10) square feet, with a maximum length of four (4) feet. The edge of each unit shall be ground square with a slight arris; and all exposed, external corners and angles shall be rounded to a radius of not more than three-sixteenths ( $3/16$ ) inch.

### **864.2. Construction.**

**864.2.1. Backing Surface.**—The glass veneer shall be set in mastic cement on a float coat of one (1) inch thick cement mortar reinforced with wire lath attached to non-combustible furring spaced not more than twelve (12) inches on centers or the veneer may be set by other approved methods.

**864.2.2. Support of Veneer.**—The base course of glass units shall be supported on a corrosion-resistive metal frame anchored to the backing and caulked with a waterproof compound at grade.

**864.3. Reinforcement.**—Metal reinforcing of cold formed corrosion-resistive angles of not less than No. 16 U.S. gage or other approved reinforcement shall be provided in all horizontal joints anchored into the wall with expansion or toggle bolts.

**864.4. Expansion Joints.**—Expansion joints shall be provided at ends and intermediate sections caulked with an approved waterproofing compound. Where necessary for water-tightness, exposed edges shall be protected with corrosion-resistive metal or other approved noncombustible flashing.

**864.5. Other Loads.**—No signs, awning brackets or other loads shall be hung directly from glass veneers, but shall be supported on framing anchored to or otherwise supported by the wall, free from contact with the glass.

## SECTION 865.0. THIN STONE AND TILE VENEERS

**865.1. Size Limitation.**—Where subject to frost and freezing temperatures, tile and terra cotta units shall be frostproof and shall not be more than two hundred and eighty-eight (288) square inches in area; and where not subject to frost action, the size of the tile may be increased not more than fifty (50) per cent in area.



**865.2. Construction.**—One (1) inch thick marble, terra cotta, and similar materials; or ceramic tile one-quarter (1/4) to one (1) inch in thickness shall be set in accordance with reference standards RS 8-21 and RS 8-61.

**865.3. Jointing.**—All joints shall be grouted and pointed with an approved waterproofed cement compound.

## **SECTION 866.0. METAL VENEERS**

**866.1. Materials.**—Veneers of metal shall be fabricated from approved corrosion-resistive alloys, or shall be covered front and back with approved porcelain enamel, or otherwise treated to render the metal resistant to corrosion.

**866.2. Construction.**—The metal veneer shall be securely attached to the masonry or supported on approved metal framing protected by painting, galvanizing or other approved protection or on wood studs and furring strips, treated with an approved preservative process.

**866.3. Waterproofing.**—All joints and edges exposed to the weather shall be caulked with approved durable waterproofing material or by other approved means to prevent penetration of moisture.

**866.4. Grounding Metal Veneers.**—Grounding of metal veneers on all buildings shall comply with the requirements of Article 15, and Massachusetts State Law.

## **SECTION 867.0. PLASTIC VENEERS**

Veneers of approved weather-resisting, noncombustible plastics shall be erected and anchored on an approved substrate waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating in accordance with the approval of the building official and the applicable portions of articles 9 and 20.

## **SECTION 868.0. THICKNESS OF MASONRY WALLS**

All masonry walls shall be of the minimum thickness specified by reference standard RS 8-51, unless designed in accordance with reference standard RS 8-50. In no case shall the combined stress due to all loads exceed the allowable working stresses specified for the materials of construction in this code and reference standard RS 8-50.

## **SECTION 869.0. THICKNESS OF PANEL WALLS**

**869.1. Solid Panel Walls.**—Panel, apron or spandrel walls as defined in article 2 supported at vertical intervals not exceeding thirteen (13) feet in height, shall not be limited in thickness, provided they meet the fireresistive requirements of article 9 and section 221.1 table 2-1 and are constructed of approved noncombustible weather-resisting materials of adequate strength to resist the wind loads specified in sections 713 and 714.

**869.2. Hollow Panel Walls.**—Unless constructed of the materials and thickness specified by this code for masonry, hollow panel walls shall be tested and approved in the assembled unit as constructed in normal practice to develop the required fireresistance ratings specified in section 221.1 table 2-1 for exposure on each face.

**869.3. Weather Resistance.**—When the construction as tested and approved for fireresistance does not possess the required weather resistance, it shall be covered on the exterior with approved corrosion-resistive metal facings or other approved noncombustible weather-resisting veneers.

**869.4. Anchorage.**—All panel walls shall be anchored to the structural frame to insure adequate lateral support and resistance to wind.

## **SECTION 870.0. PARAPET WALLS**

Unless specifically provided for in sections 906.4, 907 or other provisions of this code, required parapets for exterior masonry walls shall extend not less than two (2) feet above the roof. Nothing in this section shall be construed as requiring parapets for masonry exterior walls in one- and two-family dwellings and structures where the roof overhangs the wall or in places where such walls are capped with cornices or gutters.

**870.1. Minimum Thickness and Height.**—Parapet walls shall be the same thickness as the wall below; but in no case shall the required thickness exceed twelve (12) inches, nor shall the height be more than four (4) times the thickness unless laterally supported by noncombustible bracing or buttresses.

**870.2. Coping.**—The top of all parapet walls exposed to the weather shall be coped with approved noncombustible and weather-resisting materials.

**870.3. Construction Requirements.**—All cells in the hollow masonry units and all joints in solid, cavity, or masonry bonded

hollow wall construction shall be filled solid with mortar. All corners of masonry parapet walls shall be reinforced with joint reinforcement or its equivalent at vertical intervals not greater than twelve (12) inches. Such reinforcement shall extend around the corner for at least four (4) feet in both directions and splices shall be lapped at least six (6) inches.

## **SECTION 871.0. FOUNDATION WALLS**

**871.1. Design.**—Foundation walls shall be designed to resist frost action and to support safely all vertical and lateral loads as provided in article 7. The maximum compressive stress due to combined load shall be within the values specified for the materials used in the construction. Unless properly reinforced, tensile stresses shall be eliminated in the masonry insofar as practicable; but in any case shall not exceed those permitted by this code for plain masonry.

**871.2. Minimum Thickness.**—The thickness of foundation walls shall be not less than the thickness of the wall supported and the minimum thickness shall be limited for the various materials of construction as herein specified. Eight (8) inch foundation walls may be permitted under brick-veneered frame and under ten (10) inch cavity walls when the total height of wall supported including gables is not more than twenty (20) feet.

**871.2.1. Concrete.**—When reinforced concrete is required to resist stresses, foundation walls shall be not less than eight (8) inches thick. Concrete in foundation walls shall have a minimum compressive strength at twenty-eight (28) days of two thousand (2,000) psi, when tested in accordance with reference standard RS 8-61.

**871.2.2. Hollow and Solid Masonry and Mass Concrete.**—The thickness of masonry foundation walls shall not be less than shown in the following table. The combined height of eight (8) inch foundation wall and the wall supported shall not exceed thirty-five (35) feet.

871.2.2.a. Table 8-4

**THICKNESS OF FOUNDATION WALLS**

Foundation Wall Construction		Maximum Depth Below Grade (feet) <sup>1,2</sup>		
Type	Thickness (Inches)	Frame	Masonry Veneer	Masonry
Hollow masonry	8	4 (6)	4.5 (6)	5 (7)
	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Solid masonry	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Mass concrete	8	7	7	7

**NOTES:**

1. Depth below grade may be increased up to those shown in parentheses when such increase is warranted by soil conditions and is required by the building official.

2. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds seven (7) feet for coarse sands and gravel or four (4) feet for other soils, foundation wall thickness shall be determined by structural analysis as required in section 871.1.

**871.2.3. Hollow Unit Walls.**—Foundation walls of approved hollow masonry units shall be provided with not less than four (4) inches of solid masonry at girder bearings or shall be strengthened with buttresses; and shall only be allowed for support of one (1) and two (2) story buildings.

**871.2.4. Rubble Stone.**—Foundation walls of rough or random rubble stone shall be not less than sixteen (16) inches thick. Rough or random rubble stone masonry without level bed shall not be used for foundation walls more than ten (10) feet high or supporting buildings more than forty-five (45) feet high.

**871.2.5. Bonding.**—All masonry foundation walls shall be bonded as required for superstructure walls in section 836.

**871.3. Increased Thickness With Depth.**—When any foundation wall, other than a wall that is designed as a retaining wall, extends more than twelve (12) feet below the top of the first floor beams, the thickness of the wall shall be increased four (4) inches for each additional twelve (12) feet or fraction thereof in depth.

**871.4. Corbels on Eight Inch Foundation Walls.**—Where an eight (8) inch wall is corbeled, the top course shall be a full header course at least six (6) inches in length, extending not higher than the bottom of the floor framing. The maximum projection of one (1) unit shall neither exceed one-half ( $1/2$ ) the depth of the unit nor one-third ( $1/3$ ) its width at right angles to the face which is offset; unless specifically provided for herein the provisions of section 839 shall apply.

**871.5. Lateral Stability.**—Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of section 872.

**871.6. Lateral Bracing.**—The equivalent unbraced height of a wall supported by lateral soil pressure shall be determined by a recognized method of elastic analysis.

**871.7. Restrictions.**—Sand lime brick or gypsum tile shall not be used in foundation walls nor as part of the required thickness thereof. Wood shall not be used in the foundations of permanent structures, except as may be provided in article 7.

## SECTION 872.0. RETAINING WALLS

Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within stresses allowed by this code.

**872.1. Design.**—Retaining walls shall be designed subject to the requirements of section 872.1.1 to resist the pressure of the retained material including both dead and live load surcharges to which they may be subjected, and to insure stability against overturning, sliding, excessive soil pressure and water uplift. Particular attention shall be paid to the type of backfill and drainage.

### **872.1.1. Factor of Safety.**

- a. **Overturning.**—The minimum factor of safety against overturning of the structure as a whole shall be one

871.2.2.a. Table 8-4

**THICKNESS OF FOUNDATION WALLS**

Foundation Wall Construction		Maximum Depth Below Grade (feet) <sup>1,2</sup>		
Type	Thickness (Inches)	Frame	Masonry Veneer	Masonry
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	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Solid masonry	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Mass concrete	8	7	7	7

**NOTES:**

1. Depth below grade may be increased up to those shown in parentheses where such increase is warranted by soil conditions and is required by the building official.

2. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds seven (7) feet for coarse sands and gravel or four (4) feet for other soils, foundation wall thickness shall be determined by structural analysis as required in section 871.1.

**871.2.3. Hollow Unit Walls.**—Foundation walls of approved hollow masonry units shall be provided with not less than four (4) inches of solid masonry at girder bearings or shall be strengthened with buttresses; and shall only be allowed for support of one (1) and two (2) story buildings.

**871.2.4. Rubble Stone.**—Foundation walls of rough or random rubble stone shall be not less than sixteen (16) inches thick. Rough or random rubble stone masonry without level beds shall not be used for foundation walls more than ten (10) feet high or supporting buildings more than forty-five (45) feet high.

**871.2.5. Bonding.**—All masonry foundation walls shall be bonded as required for superstructure walls in section 836.

**871.3. Increased Thickness With Depth.**—When any foundation wall, other than a wall that is designed as a retaining wall, extends more than twelve (12) feet below the top of the first floor beams, the thickness of the wall shall be increased four (4) inches for each additional twelve (12) feet or fraction thereof in depth.

**871.4. Corbels on Eight Inch Foundation Walls.**—Where an eight (8) inch wall is corbeled, the top course shall be a full header course at least six (6) inches in length, extending not higher than the bottom of the floor framing. The maximum projection of one (1) unit shall neither exceed one-half ( $1/2$ ) the depth of the unit nor one-third ( $1/3$ ) its width at right angles to the face which is offset; unless specifically provided for herein the provisions of section 839 shall apply.

**871.5. Lateral Stability.**—Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of section 872.

**871.6. Lateral Bracing.**—The equivalent unbraced height of a wall supported by lateral soil pressure shall be determined by a recognized method of elastic analysis.

**871.7. Restrictions.**—Sand lime brick or gypsum tile shall not be used in foundation walls nor as part of the required thickness thereof. Wood shall not be used in the foundations of permanent structures, except as may be provided in article 7.

## **SECTION 872.0. RETAINING WALLS**

Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within stresses allowed by this code.

**872.1. Design.**—Retaining walls shall be designed subject to the requirements of section 872.1.1 to resist the pressure of the retained material including both dead and live load surcharges to which they may be subjected, and to insure stability against overturning, sliding, excessive soil pressure and water uplift. Particular attention shall be paid to the type of backfill and drainage.

### **872.1.1. Factor of Safety.**

- a. **Overturning.**—The minimum factor of safety against overturning of the structure as a whole shall be one

and one-half (1-1/2). Stability against overturning shall be provided by the dead load of the structure by the allowable uplift capacity of piling, by anchors, by the weight of soil directly overlying footings provided that such soil cannot be excavated without recourse to major modification of the structure or by any combination of these factors.

b. Sliding.—The minimum factor of safety against sliding of the structure under lateral load shall be one and one-half (1-1/2). Resistance to lateral loads shall be provided by friction between the foundation and the underlying soil, by passive earth pressure, by batter piles, or by plumb piles, subject to the following.

1. The resistance to lateral loads due to passive earth pressure shall be discounted where the abutting soil could be removed, inadvertently, by excavation.
2. In the case of pile supported structures, frictional resistance between the foundation and the underlying soil shall be discounted.
3. The available resistance to friction between the foundation and the underlying soil shall be predicated on an assumed friction factor of 0.5 for soils of classes 1 through 9. A greater value of coefficient of friction may be used subject to verification by analysis and test. For soils of poorer classes, the stability shall be analyzed by approved procedures of soil mechanics.

**872.2 Hydrostatic Pressure.**—In addition to earth pressure, walls shall be designed and constructed to resist hydrostatic pressures corresponding to the maximum probable ground water level.

**872.3. Coping.**—All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

**872.4. Wood Retaining Walls.**—Wood retaining walls may be used subject to the requirements of section 876.4.

## **SECTION 873.0. ISOLATED PIERS**

Isolated masonry piers shall be bonded as required for solid walls of the same thickness and shall be provided with adequate means for distributing the load on the top of the pier.

**873.1. Construction.**—Isolated piers shall be built of solid units, for which hollow units filled with concrete shall not be substituted unless designed and constructed in conformance with



requirements for columns in reference standard RS 8-50. The unsupported height of isolated piers shall not exceed twelve (12) times their least dimension.

**873.2. Piers Within Walls.**—When the clear horizontal distance between piers in masonry walls exceeds ten (10) feet they shall be considered isolated piers.

**873.2.1. Exceptions.**—Thickening of portions of walls for non-structural purposes whether or not directly under concentrated loads shall not necessarily be construed as creating an isolated pier.

## **SECTION 874.0. WATERPROOFING**

**874.1. Steel Frame.**—Exterior steel columns and girders before embedment in masonry of the required fireresistance specified in section 221.1 table 2-1 shall be protected from moisture by approved waterproofing material, a parging coat of cement mortar or by a minimum of eight (8) inches of weathertight masonry.

**874.2. Chases.**—The backs and sides of all chases in exterior walls with less than eight (8) inches of approved masonry to the exterior surface shall be insulated and waterproofed.

**874.3. Foundations.**—Exterior walls and floors in contact with earth below grade enclosing habitable or occupiable rooms or spaces shall be made waterproof. Floors and portions of exterior walls below grade shall be reinforced to withstand water pressure as prescribed in sections 710 and 871 if required.

**874.4. Types of Waterproofing.**—Portions of exterior walls below grade, required herein to be made waterproof shall be protected with not less than a one-coat application of approved waterproofing paint, or a one-half (1/2) inch thick parging coat of Portland cement mortar or other approved waterproof covering; and if furred shall be done so with impervious material. The processes and methods used to render buildings, structures or parts thereof watertight, as herein required, shall meet with the approval of the building official.

**874.5. Protection From Heat.**—Under boilers, furnaces, and other heat-producing apparatus, suitable insulation shall be installed to protect the waterproofing against damage from heat.

## **SECTION 875.0. RATPROOFING**

All buildings and structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or

work; or in which feed, food or foodstuffs are stored, prepared, processed, served or sold shall be constructed rat and vermin-proof in accordance with the provisions of this section. Every basement or cellar in buildings hereafter erected shall be completely covered with a ratproof floor of concrete, or solid masonry laid in cement mortar, not less than two (2) inches thick, or other approved flooring.

### **875.1. Grade Protection.**

**875.1.1. Apron.**—When required for protection against rodents, all exterior walls at and near grade shall be constructed or assembled of component materials, or chemically or otherwise treated to render the construction rat or vermin-proof. When not provided with a continuous masonry foundation wall, a masonry or reinforced concrete apron, not less than four (4) inches in thickness or of other approved noncombustible, water-resisting and rat-proofing material of required strength, shall be installed around the entire perimeter of the buildings.

**875.1.2. Height of Apron.**—The apron shall extend sufficiently above grade to provide for the average snow fall, but not less than eight (8) inches above, nor less than twenty-four (24) inches below grade level; and, if serving as a foundation bearing wall, to sufficiently greater depth to assure protection from frost action as required in section 729. When the superstructure walls are not constructed of masonry, the spaces between studs shall be filled to a height of two (2) feet above grade with concrete or other material indestructible by rats.

**875.2. Grade Floors.**—Where continuous concrete grade floor slabs are provided, no open spaces shall be left between slab and walls, and all openings in the slab shall be protected.

### **875.3. Opening Protection.**

**875.3.1. Wall Openings.**—Openings in the apron required for ventilation or other purposes shall be guarded with corrosion-resistive rodent-proof shields of not less than No. 22 U.S. gage perforated steel sheets, or No. 20 B & S gage aluminum or No. 16 U.S. gage expanded metal or wire mesh screens, with no more than one-half (1/2) inch mesh openings.

**875.3.2. Slab Openings.**—Access openings in grade floor slabs shall be protected with concrete, masonry, metal or other corrosion-resistive non-combustible covers of adequate strength to support the floor loads.

**875.3.3. Pipes and Conduits.**—All openings for pipe, conduit, cable and similar purposes at or near grade shall have snugly-fitted collars to eliminate all open spaces.

**SECTION 876.0. PROTECTION AGAINST DECAY AND TERMITES****876.1. Where Conditions are Favorable to Decay.**

**876.1.1. Wood in Contact with the Ground.**—All wood in contact with the ground and supporting permanent structures shall be approved treated wood.

**876.1.2. Untreated Wood.**—Untreated wood may be used where entirely below ground water level or continuously submerged in fresh water and may be used in contact with the ground for detached accessory buildings not intended for human occupancy, for temporary structures and for fences.

**876.2. Wood Joists or the Bottom of Wood Structural Floors.**—When wood joists or the bottom of wood structural floors without joists are closer than eighteen (18) inches or wood girders are closer than twelve (12) inches, to exposed ground located within the periphery of the building over crawl spaces or unexcavated areas, they shall be approved durable species or treated wood. Ventilation shall be provided as required in section 508.0.

**876.2.1. Additional Requirements.**—Positive drainage shall be provided for all areas under the building not occupied by basements or cellars, and the ground surface shall be covered with a vapor barrier. All loose wood and debris including wood forms shall be removed from spaces under the building. All stumps and roots shall be grubbed to a minimum depth of twelve (12) inches.

**876.3. Sills.**—All sills which rest on concrete or masonry exterior walls and are less than eight (8) inches from exposed earth shall be of approved durable species or treated wood.

**876.3.1. Sleepers and Sills.**—Sleepers and sills on a concrete or masonry slab which is in direct contact with earth shall be raised by masonry or concrete at least three (3) inches above the top of such slab except when approved durable species or treated wood is used.

**876.3.2. Posts or Columns.**—Wood posts or columns in cellars shall be supported by piers projecting at least three (3) inches above the finish floor and separated therefrom by an approved impervious barrier except when approved durable species or treated wood is used. Posts or columns used in damp locations below grade shall be of approved durable species or treated wood.

**876.3.3. Wall Pockets.**—Ends of wood girders entering masonry or concrete walls shall be provided with a one-half (1/2) inch

air space on top, sides and end unless approved durable species or treated wood is used.

**876.3.4. Clearance Between Wood Siding.**—Clearance between wood siding and earth on the exterior of a building shall be not less than six (6) inches.

**876.4. Wood Used in a Retaining Wall.**—Wood used in a retaining wall shall be approved durable species or treated wood. Retaining walls of wood shall be limited to the following:

- a. When the wall is not more than two (2) feet in height and is located on the property line.
- b. When the wall is not more than four (4) feet in height and is separated from the property line by a minimum distance equal to the height of the wall.
- c. The wall shall not exceed six (6) feet in height. A wood retaining wall shall be separated from any permanent building by a minimum distance equal to the height of the wall.

**876.5. Where Approved Durable Species or Treated Woods are Required.**—Where approved durable species or treated woods are required in this code, the building official may require identification by an approved mark of certificate of inspection.

**876.6. Treatment.**—Where treatment of wood members is required by this code, preservatives and methods of treatment shall conform to the standards for treatment and preserving of lumber listed in reference standards RS 8-62 and RS 7-9.

## **SECTION 877.0. FIRE PROTECTION AND FIRESTOPPING**

To prevent the free passage of flame through concealed spaces or openings in event of fire, provision shall be made to trim all combustible framing away from sources of heat, to provide effective fire barriers against the spread of fire between all subdivisions and all stories of the building, to provide adequate fire separation against exterior exposure, and to firestop all vertical and horizontal draft openings as specified herein.

**877.1. Beam Separation in Ordinary Construction (types 3-B and 3-C).**—All wood and other combustible floor, roof and other structural members framing into masonry walls shall be cut to a bevel of three (3) inches in the depth and shall project not more than four (4) inches into the wall; and the distance between embedded ends of adjacent beams or joists entering into the wall from opposite sides shall be not less than four (4) inches.

**877.2. Girder Separation in Heavy Timber Construction (type 3-A).**—Wood girders framing into masonry or concrete walls shall have at least eight (8) inches of masonry or concrete between their ends and the outside face of walls and at least eight (8) inches of masonry between adjacent beams entering the wall from opposite sides. The girders shall be fire-cut, supported in pockets or in self-releasing metal boxes, or otherwise supported to minimize destruction of the wall in the event of fire.

**877.3. Flues and Chimneys.**—The space about a chimney shall be firestopped at each floor and ceiling level with noncombustible material, unless such space is treated as a vertical opening and is enclosed as provided in article 9. Combustible framing or other woodwork shall be trimmed not less than two (2) inches away from all flues, chimneys and fireplaces, and six (6) inches away from flue openings.

**877.4. Fireplaces.**—Hearths of noncombustible construction and fireboards, mantels and other combustible trim shall comply with section 1013 governing fireplace construction.

**877.5. Concealed Roof Spaces.**—Concealed roof spaces enclosed by combustible ceiling and roof construction shall be subdivided into areas of not more than three thousand (3,000) square feet as provided in section 219.0.

**877.6. Exterior Cornices.**—Exterior cornices where permitted of combustible construction in section 926, or when erected with combustible frames shall be firestopped at maximum intervals of twenty (20) feet. If noncontinuous, they shall have closed ends, with at least four (4) inches separation between adjoining sections.

**877.7. Wall Furring.**—In masonry wall construction (types 3-A, 3-B and 3-C) and in frame construction (types 4-A and 4-B) where walls are furred, the space between the inside of the furring and the face of the wall for the full depth of the combustible floor or roof joists shall be firestopped.

**877.8. Combustible Trim and Finish.**—The space behind combustible trim and finish where permitted under this code and all other hollow spaces where permitted in fireresistive construction shall be back-filled with noncombustible materials or firestopped as required in section 921.0.

**877.9. Firestopping.**—Firestopping meeting the requirements of section 921 shall be provided in stud walls and partitions at each floor level and between the ceiling of the top story and

roof space; in all furred spaces of frame walls and studded off spaces of masonry walls at maximum intervals of eight (8) feet; at the top and bottom and at least once in the middle of each run of stairs; in concealed wall pockets for sliding doors; for chases at floor and ceiling levels; at openings for pipes, belts, shafting, chutes and conveyors passing through combustible floors or partitions with close-fitting noncombustible caps or metal shutters or other approved noncombustible means; and in all other locations that would permit the free travel of flame.

**877.10. Steel Framing.**—Where structural steel beams or other metal members frame into exterior, party, fire or enclosure walls of reinforced concrete, the ends shall have protection against fire of the rating specified for the wall.

## **SECTION 878.0. THERMAL INSULATING MATERIALS**

Insulating batts, blankets, fills or similar types of materials, including vapor barriers and breather papers or other coverings which are a part of the insulation, incorporated in construction elements shall be installed and used in a manner that will not increase the fire hazard characteristics of the building or any part thereof.

**878.1. Exposed Installation.**—Such materials when exposed as installed shall comply with the interior finish requirements as regulated in section 922.

**878.2. Deleted.**

**878.3. Facings and Coverings.**—Vapor barriers, breather papers or other coverings of insulating materials, when installed adjacent to or not more than one and one-half (1-1/2) inches from the unexposed surface of ceiling or sidewall interior finish, or when installed in completely enclosed wall, ceiling joist or rafter spaces, firestopped as required in section 877 are not required to have a flame resistance rating.



AITC 100-65 1965  
Timber Construction Standards

AITC 103-65 1965  
Standard for Structural Glued Laminated Timber

ANSI A42.1 1964  
Specifications for Gypsum Plastering

ANSI A42.2 1946  
Specifications for Portland Cement Stucco

ANSI A42.3 1946  
Specifications for Portland Cement Plastering

ANSI A42.4 1967  
Specifications for Interior Lathing and Furring

ANSI A42.5 1960  
Specifications for Lime Cement Stucco

ANSI A59.1 1968  
Specifications for Reinforced Gypsum Concrete

ANSI A94.1 1961  
Specifications for Interior Marble

ANSI A94.2 1961  
Specifications for Thin Exterior Marble Veneer (Two  
Inches and Less in Thickness)

ANSI A94.3 1961  
Specifications for Thin Exterior Marble in Curtain  
or Panel Walls

ANSI A97.1 1965  
Specifications for Application and Finishing of  
Wallboard

ANSI A108.1 1967  
Specifications for (Including Requirements of Related  
Divisions) Installation of Glazed Ceramic Wall Tile  
in Cement Mortars



ANSI A108.2 1967

Specifications for (Including Requirements of Related Divisions) Installation of Ceramic Mosaic Tile in Cement Mortars

ANSI A108.3 1967

Specifications (Including Requirements of Related Divisions) for Installation of Quarry Tile and Pavers in Cement Mortars

ANSI A108.5 1967

Specifications for Installation of Ceramic Tile with Dry Set Portland Cement Mortar

ANSI A118.1 1967

Specifications for Dry-Set Portland Cement Mortar

ANSI Z26.1 1950

Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways

APA 1967

Design and Fabrication of Flat Plywood Stressed Skin Panels

APA 1967

Design and Fabrication of Plywood Beams

APA 1967

Design and Fabrication of Plywood Curved Panels

APA 1967

Fabrication of Plywood Folded Plates

APA 1964

Lab. Bulletin 58-B—Plywood Folded Plate Design Method

APA 1966

Plywood Design Specifications

ASTM A27 1965  
Specifications for Mild-To-Medium Strength Carbon-Steel Castings for General Application

ASTM A48 1964  
Specifications for Gray Iron Castings

ASTM A148 1965  
Specifications for High-Strength Steel Castings for Structural Purposes

ASTM A377 1966  
Specifications for Cast Iron Pressure Pipe

ASTM C5 1959  
Specifications for Quicklime for Structural Purposes

ASTM C6 1949  
Specifications for Normal Finishing Hydrated Lime

ASTM C10 1964  
Specifications for Natural Cement

ASTM C22 1950  
Specifications for Gypsum

ASTM C28 1968  
Specifications for Gypsum Plasters

ASTM C31 1969  
Making and Curing Concrete Compression and Flexure Test Specimens in the Field

ASTM C33 1969  
Specifications for Concrete Aggregates

ASTM C34 1962  
Specifications for Structural Clay Load Bearing Wall Tiles

ASTM C35 1967  
Specifications for Inorganic Aggregates for Use in Gypsum Plaster

- ASTM C36 1968  
Specifications for Gypsum Wall Board
- ASTM C37 1967  
Specifications for Gypsum Lath
- ASTM C39 1968  
Test for Compressive Strength of Molded Concrete  
Cylinders
- ASTM C42 1968  
Method of Obtaining and Testing Drilled Cores and  
Sawed Beams of Concrete
- ASTM C52 1954  
Specifications for Gypsum Partition Tile or Block
- ASTM C55 1966  
Specifications for Concrete Building Brick
- ASTM C56 1962  
Specifications for Structural Clay Non-Load Bearing  
Tile
- ASTM C57 1957  
Specifications for Structural Clay Floor Tile
- ASTM C61 1964  
Specifications for Keene's Cement
- ASTM C62 1966  
Specifications for Building Brick (Solid Masonry Units  
Made from Clay or Shale)
- ASTM C73 1967  
Specifications for Calcium Silicate Face Brick (Sand-  
Lime Brick)
- ASTM C79 1967  
Specifications for Gypsum Sheathing Board

ASTM C90 1966  
Specifications for Hollow Load-Bearing Concrete Masonry Units

ASTM C91 1969  
Specifications for Masonry Cement

ASTM C94 1969  
Specifications for Ready-Mixed Concrete

ASTM C126 1969  
Specifications for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units

ASTM C129 1964  
Specifications for Hollow Non-Load Bearing Concrete Masonry Units

ASTM C143 1966  
Test for Slump of Portland Cement Concrete

ASTM C145 1966  
Specifications for Solid Load-Bearing Concrete Masonry Units

ASTM C150 1968  
Specifications for Portland Cement

ASTM C172 1968  
Sampling Fresh Concrete

ASTM C192 1969  
Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory

ASTM C206 1949  
Specifications for Special Finishing Hydrated Lime

ASTM C207 1949  
Specifications for Hydrated Lime for Masonry Purposes

ASTM C208 1960  
Specifications for Structural Insulating Board Made  
from Vegetable Fibers

ASTM C270 1968  
Specifications for Mortar for Unit Masonry

ASTM C330 1969  
Specifications for Lightweight Aggregates for Struc-  
tural Concrete

ASTM C331 1969  
Specifications for Lightweight Aggregates for Concrete  
Masonry Units

ASTM C332 1966  
Specifications for Lightweight Aggregates for Insu-  
lating Concrete

ASTM C476 1963  
Specifications for Mortar and Grout for Reinforced  
Masonry

ASTM C494 1968  
Specifications for Chemical Admixtures for Concrete

ASTM C595 1968  
Specifications for Blended Hydraulic Cements

ASTM D2277 1966  
Specification for Fiberboard Nail-Base Sheathing

AWPA C2 1969  
Standard for the Preservative Treatment of Lumber,  
Timbers, Bridge Ties and Mine Ties by Pressure  
Processes

AWPA C4 1969  
Standard for Preservative Treatment of Poles by  
Pressure Processes

- AWPA C9 1967  
Standard for the Preservative Treatment of Plywood  
by Pressure Processes
- AWS D1.0-69 1969  
Code for Welding in Building Construction
- NCMA 1968  
Specification for the Design and Construction of  
Loadbearing Concrete Masonry
- NFoPA 1966  
Simplified Spans for Joists and Rafters in Residential  
Construction
- NFoPA 1968  
National Design Specification for Stress Grade Lum-  
ber and Its Fastenings
- NFoPA 1957  
Wood Structural Design Data
- SCPI 1966  
Recommended Building Code Requirements for En-  
gineered Brick Masonry
- SJI-AISC 1966  
Standard Specifications and Load Tables for Long  
Span Steel Joists, LJ-Series and LH-Series
- SJI-AISC 1965  
Standard Specifications and Load Tables for Open  
Web Steel Joists, J-Series and H-Series
- USDC CS31 1952  
Wood Shingles (Red Cedar, Tidewater, Red Cypress  
and California Redwood)
- USDC CS181 1952  
Adhesive, Water Resistant Organic, for Installation  
of Clay Tile

USDC CS253 1963  
Structural Glued—Laminated Lumber

US Fed. Specification DD-G-451c 1968  
Glass, Flat and Corrugated, for Glazing Mirrors,  
and Other Uses

US Fed. Specification SS-S-721c 1964  
Stone, Architectural Cast

VI 1963  
Standard Specifications for Vermiculite Plastering

Empirical Provisions for Wood Frame Construction

Minimum and Empirical Thickness Requirements for  
Masonry Walls

Minimum Nailing Schedule

On Site Quality Control

Plywood Construction

**RS 8-1** ASTM C62 1966  
Specifications for Building Brick (Solid Masonry Units  
Made from Clay or Shale)

**RS 8-2** ASTM C73 1967  
Specifications for Calcium Silicate Face Brick (Sand-  
Lime Brick)

**RS 8-3** ASTM C55 1966  
Specifications for Concrete Building Brick

**RS 8-4** ASTM C34 1962  
Specifications for Structural Clay Load Bearing Wall  
Tile

- RS 8-5** ASTM C56 1962  
Specifications for Structural Clay Non-Load Bearing Tile
- RS 8-6** ASTM C57 1957  
Specifications for Structural Clay Floor Tile
- RS 8-7** ASTM C126 1969  
Specifications for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
- RS 8-8** ASTM C90 1966  
Specifications for Hollow Load-Bearing Concrete Masonry Units
- RS 8-9** ASTM C129 1964  
Specifications for Hollow Non-Load Bearing Concrete Masonry Units
- RS 8-10** ASTM C145 1966  
Specifications for Solid Load-Bearing Concrete Masonry Units
- RS 8-11** ASTM C52 1954  
Specifications for Gypsum Partition Tile or Block
- RS 8-12** U.S. Federal Spec. SS-S-721c 1964  
Stone, Architectural, Cast
- RS 8-13** ASTM C150 1968  
Specifications for Portland Cement
- RS 8-14** ASTM C10 1964  
Specifications for Natural Cement
- RS 8-15** ASTM C91 1968  
Specifications for Masonry Cement
- RS 8-16** ASTM C5 1959  
Specifications for Quicklime for Structural Purposes



- RS 8-17** ASTM C207 1969  
Specifications for Hydrated Lime for Masonry Purposes
- RS 8-18** ASTM C270 1968  
Specifications for Mortar for Unit Masonry
- RS 8-19** ASTM C476 1963  
Specifications for Mortar and Grout for Reinforced Masonry
- RS 8-20** ASTM C22 1950  
Specifications for Gypsum
- RS 8-21** ANSI A108.5 1967  
Specifications for Installation of Ceramic Tile with Dry Set Portland Cement Mortar
- RS 8-22** ANSI A118.1 1967  
Specifications for Dry-Set Portland Cement Mortar
- RS 8-23** USDC CS181 1952  
Adhesive-Water Resistant Organic, for Installation of Clay Tile
- RS 8-24** ASTM C33 1969  
Specifications for Concrete Aggregates
- RS 8-25** ASTM C330 1969  
Specifications for Lightweight Aggregates for Structural Concrete
- ASTM C331 1969  
Specifications for Lightweight Aggregates for Concrete Masonry Units
- ASTM C332 1966  
Specifications for Lightweight Aggregates for Insulating Concrete
- RS 8-26** ASTM C94 1969  
Specifications for Ready-Mixed Concrete

- RS 8-27** AITC 103-65 1965  
Standard for Structural Glued Laminated Timber
- RS 8-28** ANSI A42.1 1964  
Specifications for Gypsum Plastering
- RS 8-29** ANSI A42.4 1967  
Specifications for Interior Lathing and Furring
- RS 8-30** ANSI A42.5 1960  
Specifications for Lime Cement Stucco
- RS 8-31** VI 1963  
Standard Specifications for Vermiculite Plastering
- RS 8-32** ANSI A42.2 1946  
Specifications for Portland Cement Stucco
- ANSI A42.3 1946  
Specifications for Portland Cement Plastering
- RS 8-33** ASTM C35 1967  
Specifications for Inorganic Aggregates for Use in Gypsum Plaster
- ASTM C6 1949  
Specifications for Normal Finishing Hydrated Lime
- ASTM C206 1949  
Specifications for Special Finishing Hydrated Lime
- ASTM C28 1968  
Specifications for Gypsum Plasters
- ASTM C61 1964  
Specifications for Keene's Cement
- ASTM C595 1968  
Specifications for Blended Hydraulic Cements
- RS 8-34** ASTM C208 1960  
Specifications for Structural Insulating Board Made from Vegetable Fibers

**RS 8-35** ASTM C37 1967  
Specifications for Gypsum Lath

**RS8-36 PLYWOOD CONSTRUCTION**

**1.1 DEFINITIONS.—**

**1.1.1. Plywood.**—Plywood is a laminated board or panel, consisting of an odd number of veneer sheets placed alternately crosswise and bonded together with either a water-resistant or waterproof adhesive that forms a bond stronger than the wood itself.

**1.1.2. Plywood Component.**—A plywood component, for the purposes of this standard, shall be defined as an element of a structural member formed by the assembly of plywood parts or of plywood parts with parts of wood or other materials so as to form an integral assemblage.

**1.2. Conformance With Standard.**—Materials, design, and fabrications shall conform to reference standard RS8-37 except that the word “should” in that standard shall be mandatory.

**1.3. Exterior Use.**—All plywood when permanently exposed in outdoor applications shall be of exterior type. Plywood used for covering the exterior of outside walls and applied directly to supports shall be at least 3/8 inch nominal thickness. Panel joints shall be backed solidly by studs or by nailing pieces at least 2 inches wide (nominal), except over sheathing or where applied as lapped siding, or when otherwise made waterproof. Plywood siding applied over sheathing shall be not less than 1/4 inch thick.

**1.4. Roof Sheathing.**—Where plywood is used as roof sheathing the spans shall not exceed the values given in table RS8-36-1.

**Table RS 8-36-1****Maximum Spans For Plywood Roof and Floor Sheathing<sup>a</sup>**

(Plywood continuous over two or more spans and face grain perpendicular to supports)

Panel Identi- fication Index <sup>b</sup>	Roof				Floor  Maximum Span <sup>d</sup> (Inches)
	Maximum Span (Inches)		Load (psf)		
	Edges Blocked	Edges Un- Blocked	Total Load	Live Load	
12/0	12	12	130	100	0
16/0	16	16	75	55	0
20/0	20	20	55	45	0
24/0	24 <sup>e</sup>	24	60	45	0
30/12	30	26	55	40	12 <sup>f</sup>
32/16	32	28	50 <sup>c</sup>	40	16 <sup>g</sup>
36/16	36	30	50 <sup>c</sup>	35 <sup>c</sup>	16 <sup>g</sup>
42/20	42	32	45 <sup>c</sup>	35 <sup>c</sup>	20 <sup>g</sup>
48/24	48	36	40 <sup>c</sup>	40	24

**Notes—**

a These values apply for Structural I and II, Standard Sheathing, and C-C grades only. Spans shall be limited to values shown because of possible effect of concentrated loads.

b Identification Index appears on all panels in the construction grades listed in footnote a.

c For roof live load of 40 psf or total load of 55 psf, decrease spans by 13 per cent or use panel with next greater Identification Index.

d Plywood edges shall have approved tongue and groove joints or shall be supported with blocking, unless 1/4 inch minimum thickness Underlayment is installed, or finish floor is 25/32 inch wood strip. Allowable uniform load based on deflection of 1/360 of span is 100 psf.

e 1/2 inch Structural I, when continuous over one support, may be laid with face grain parallel to supports provided all panel edges are blocked or other approved type edge support is provided, the spacing of the supports does not exceed 24 inches on center, and the live load does not exceed 30 pounds per square foot. For other grades, a thickness of 5/8 inch is required.

f May be 16 inches if 25/32 inch wood strip flooring is installed at right angles to joists.

g May be 24 inches if 25/32 inch wood strip flooring is installed at right angles to joists.

**1.5. Plywood Subfloors.**—Where plywood is used as structural subflooring the maximum spans shall not exceed the values given in table RS8-36-1. If resilient flooring or carpeting is to be applied directly to a plywood subfloor without separate underlayment, the panels shall be underlayment grade C-C plugged, or any sanded grade of exterior type plywood. This thickness shall not be less than the values prescribed for the given spans and loads shown in Table RS8-36-2.

**Table RS 8-36-2**

**Minimum Thickness For Plywood Combination Sub-Floor — Underlayment<sup>a</sup>**

(Plywood continuous over two or more spans and face grain perpendicular to supports)

Species Group	Maximum Spacing Of Supports (In.)		
	16	20	24
1	1, 2 in.	5, 8 in.	3, 4 in.
2, 3	5/8 in.	3, 4 in.	7, 8 in.
4	3, 4 in.	7, 8 in.	1 in.

**Note**—

a Applicable to Underlayment Grade, C-C (Plugged) and all grades of sanded Exterior type plywood. Spans limited to values shown because of possible effect of concentrated loads. Allowable uniform load based on deflection of 1/360th of span is 100 psf. Plywood edges shall have approved tongue and groove joints or shall be supported with blocking unless 1/4 inch minimum thickness Underlayment is installed, or finish floor is 25/32 inch wood strip. If wood strips are perpendicular to supports, thickness as shown for 16- and 20-inch spans may be used on 24 inch span.

**1.6. Special 1-1/8 Inch Plywood Subflooring for 48 Inch Span.**—Such material, if conforming to design specifications of the American Plywood Association special 2-4-1 panel may be used over girders spaced not more than 48 inches on centers, with edges on 2 inch x 4 inch blocking securely attached to main girders, provided the total floor load does not exceed 80 psf. A tongue and groove joint may be used in lieu of blocking.

**1.7. Plywood Wall Sheathing.**—Plywood may be applied either horizontally or vertically and as indicated in building code provisions for the bracing of exterior walls.

**1.8. Fastening.**—Plywood sheathing and subflooring—Plywood sheathing and subflooring shall have the maximum fastener spacing on framing as prescribed in Table RS8-36-3.

**Table RS 8-36-3  
Fastening Schedule**

Plywood Thickness (in.)	Common Nail and Staple Size Type	Fastener Spacing (in.) <sup>a</sup>	
		Panel Edges	Inter- mediate Support
Plywood Roof and Wall Sheathing			
1/2 or less	6d Smooth or deformed .....	6	12
5/8 or greater	8d Smooth or deformed .....	6	12
5 16, 3 8, 1 2	16 gage galvanized wire staples, 3 8 in. minimum crown. Length of one in. plus plywood thickness except 1-1 4 inch. for 5 16 in. plywood ....	4	8
Plywood Subflooring			
1/2	6d Smooth or deformed.....	6	10
5 8, 3 4, 7 8	8d Smooth or 6d deformed ..	6	10
1, 1-1 8	10d Smooth or 8d deformed..	6	6
1 2	16 gage galvanized wire staples, 3 8 in. minimum crown.	4	7
5 8	1-5 8 in. long .....	2-1 2	4

**NOTE—**

a Where spans are 48 inches or more nails shall be spaced at 6 inches at all supports.

**1.9. Plywood Siding.**— Plywood siding shall be applied and nailed as prescribed in Table RS8-36-4.

**Table RS 8-36-4**  
**Plywood Siding**

Type of Siding	Plywood <sup>b,c</sup> Thickness (in.)	Nail Size	Nail Type	Nail Spacing (in.)	
				Panel Edges <sup>a</sup>	Intermediate Supports
Panel Siding	3/8 <sup>e</sup>	6d	Corrosive resistant box or casing nails	6	12
	1/2, 5/8 and thicker	8d		6	12
Lap Siding	3/8	6d	Corrosive resistant box or casing nails		One nail per stud for width 12 in. or less. 8 in. for width greater than 12. in.
	1/2 and thicker	8d		4	

**NOTES—**

a Minimum edge distance of 3/8 in.

b In direct-to-stud applications 5-ply panels of 1/2 in. nominal thickness or more may be used over studs 24 in. o.c. if texturing does not penetrate through the face veneer. All other panels must be used over studs spaced not more than 16 in. on center.

c Special requirement: Nails on ship-lap edges of 5/8 in. and thicker panel siding 3/8 in. from exposed edge and slant driven towards edge; do not set.

e When separate sheathing is applied, 3/8 in. panel and 303 siding may be used over supports spaced 24 inches on center, 1/4 inch over supports 16 inches on center.

**1.10. Plywood Diaphragms.**— Plywood diaphragms may be used to resist horizontal forces when designed and constructed in accordance with reference standard RS8-57.

- RS 8-37** APA 1966  
Plywood Design Specifications
- RS 8-38** APA 1967  
Design and Fabrication of Plywood Beams
- APA 1967  
Design and Fabrication of Plywood Curved Panels
- APA 1964  
Lab. Bulletin 58-B—Plywood Folded Plate Design Method
- APA 1967  
Fabrication of Plywood Folded Plates
- RS 8-39** ASTM C79 1967  
Specifications for Gypsum Sheathing Board
- RS 8-40** ANSI A97.1 1965  
Specifications for Application and Finishing of Wall-board
- RS 8-41** ASTM C36 1968  
Specifications for Gypsum Wall Board
- RS 8-42** AISC 1969  
Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings

**Modifications.**— Unless otherwise specifically dated, national standards cited within this reference standard shall be those current on June 1, 1969. The provisions of AISC 1969 Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings shall be applied in conformance with the AISC-1969 Commentary on the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and shall be subject to the following modifications: (The section and paragraph numbers are from that standard.)



**1.3. Loads and Forces. —**

Delete this section and substitute the following:

“The provisions of the Boston Code for loads shall apply.”

**1.4. Material. —**

**General.** — The provisions relating to certification as the term is used in this section shall be only as required and approved by the building official.

**1.4.1.3.** Add the following new subsection:

“Steels of higher strength than are covered by the above mentioned ASTM Specifications may be used provided the design is based upon the minimum properties of such higher strength steel as certified by the manufacturer’s test reports and approved by the building official.”

**1.4.1.4.** Add the following new subsection:

“Structural steel members installed in buildings in the year 1924 or earlier shall not be stressed in excess of 16,000 psi. Similar members installed after 1924 and prior to the year 1943, and after 1942 and prior to October 1963 shall not be stressed in excess of 18,000 psi and 20,000 psi respectively.

Structural steel which has previously been used in a building or other structure or which has been fabricated for such use, shall not be used in another building or structure except with the approval of the building official and under such conditions as he may in each case specify.”

**1.4.2.** Add the following sentence at the end of this subsection:

“The building official may require reasonable tests from time to time of metals and alloys to determine their quality and whether they conform to the requirements of this section.”

**1.4.6.** Add the following new subsection:

**“Pipe Steel.**

Pipe steel shall conform to the following specifications: Welded and Seamless Steel Pipe, ASTM A53-65.”

**1.5. Allowable Unit Stresses**

**1.5.1.3. Compression.** — Add the following subsection:

**“1.5.1.3.6.** The above formulas (1.5-1) and (1.5-2) shall be used in conjunction with section 847.0 of the Boston code (Concrete Filled Pipe Columns).”

**1.5.5. Masonry Bearing.** — Delete this section and substitute the following:

“The applicable provisions of the Boston Code shall apply.”

**1.5.6. Wind and Seismic Stresses.** — Delete and substitute the following:

“The applicable provisions of article 7 of the Boston Code shall apply.”

**1.6. Combined Stresses**

**1.6.1. Axial Compression and Bending.** — At the end of this subsection add the following sentence:

“This section shall be used in conjunction with section 847.0 of the Boston Code (Concrete Filled Pipe Columns.)”

**1.10. Plate Girders and Rolled Beams**

**1.10.9. Horizontal Forces.** — Delete reference to section 1.3.4 and substitute applicable provisions of the Boston Code for loads.

**1.11. Composite Construction**

**1.11.1. Definition.** — Add the following paragraph:

“Concrete materials shall meet the applicable requirements of the building code. Where concrete having aggregates other than those in accordance with RS8-24 is used, the capacity of the shear connectors to resist

the applied load under the proposed conditions of use shall be investigated. Composite construction used for members subject to heavy vehicle loads (except where the applied vehicle load is limited to passenger cars), shall be proportioned in accordance with the requirements of reference standard RS8-74.”

### **1.20. Expansion**

Delete this text and substitute the following:

“The provisions of section 710.8 of the Boston Building Code shall apply.”

### **1.24. Shop Painting**

Delete this section. The provisions of section 827 shall apply.

### **1.25. Erection**

Delete section 1.25.5 and add the following:

**“1.25.5. Field Connections. —**

Field connections shall meet the requirements for corresponding types of shop connections as described in section 1.23. No holes, copes, or cuts of any type shall be made to facilitate erection unless specifically shown on the shop drawings or authorized in writing by the party or parties designated for inspection of said work.”

Add Section as follows:

**“Section 1.27. Minimum Thickness of Metal. —** All exterior members of structural steel, except roofing and siding, that are exposed to the weather shall have a protective coating as required by the provisions of Section 1.24 and shall have a minimum thickness of metal of 0.23 inch. Exception: The minimum thickness of metal need only conform to the requirements for stress under the following conditions:

- (1) Exterior members exposed to the weather. — An approved type of atmospheric corrosion resistant steel is used or exposed surfaces are zinc coated



**Section 6 Tests for Special Cases. —**

1. Add to paragraph 6.1(e) the following sentence: “All laboratories shall be subject to the approval of the building official.”

Add the following section:

**“Section 7. Fabrication and Erection. —**

The applicable provisions of reference standard RS8-42 shall apply, supplemented as follows:

**7.1 Fabrication. —**

(a) Straightening and flattening. — All material shall be clean and straight. If straightening or flattening is necessary, it shall be done by a suitable process or method and in a manner that will not injure the material.

(b) Profiles and distortion. — Profiles used structurally shall conform to the specified dimension. Care shall be taken not to stretch, bend, or otherwise distort parts of the sections unless such forming is an integral part of the design.

(c) Cutting and punching. — Components may be cut by slitting, shearing, sawing, or flame cutting. All punched holes and sheared or flame cut edges of material in members subject to calculated stress shall be clean and free from notches and burred edges.

(d) Bolted and riveted connections. — Holes for bolts or rivets shall be 1/16 inch larger than the nominal diameter of the bolt and rivet when the diameter of bolt or rivet is 1/2 inch and larger, and 1/32 inch larger than the nominal diameter of the bolt or rivet when the diameter is less than 1/2 inch.

**7.2 Erection.** — Care shall be taken to avoid damage when loading, unloading, and handling members.”

AISI 1968

Specification for the Design of Light Gage Cold-Formed Stainless Steel Structural Members

**Modifications.** — The provisions of AISI 1968 specification for the design of light gage cold-formed stainless steel structural members shall be subject to the following modifications. The section and paragraph numbers are from that standard.

**3.9. Wind or Earthquake Stresses.** — Delete section

3.9.1 and 3.9.2 and substitute the following:

“The provisions of the Boston Building Code for loads shall apply.”

#### **4.2. Welds. —**

**4.2.1. Fusion Welds. —**In the third paragraph delete the words “Code for Welding in Building Construction, D1.0 of the American Welding Society, of latest edition,” and substitute “Reference Standard RS8-73.”

#### **Section 6 Tests for Special Cases. —**

1. Add to paragraph 6.2.1(c) the following sentence: “All laboratories shall be subject to the approval of the building official.”

Add the following section:

#### **“Section 7. Fabrication and Erection. —**

The applicable provisions of reference standard RS8-42 shall apply, supplemented as follows:

##### **7.1 Fabrication. —**

(a) Straightening and flattening. — All material shall be clean and straight. If straightening or flattening is necessary, it shall be done by a suitable process or method and in a manner that will not injure the material.

(b) Profiles and distortion—Profiles used structurally shall conform to the specified dimension. Care shall be taken not to stretch, bend, or otherwise distort parts of the sections unless such forming is an integral part of the design.

(c) Cutting and punching. —Components may be cut by slitting, shearing, sawing, or flame cutting. All punched holes and sheared or flame cut edges of material in members subject to calculated stress shall be clean and free from notches and burred edges.

(d) Bolted and riveted connections. —Holes for bolts or rivets shall be 1/16 inch larger than the nominal diameter of the bolt and rivet when the diameter of bolt or rivet is 1/2 inch and larger, and 1/32 inch larger than the nominal diameter of the bolt or rivet when the diameter is less than 1/2 inch.

**7.2 Erection. —**Care shall be taken to avoid damage when loading, unloading, and handling members.”

**RS8-44** SJI-AISC 1965  
Standard Specifications and Load Tables for Open Web Steel Joists, J-Series and H-Series

SJI-AISC 1967  
Standard Specifications and Load Tables for Long Span Steel Joists, LJ-Series and LH-Series

**Modifications.**—The provisions of the standard specifications for open web steel joists as listed above shall be subject to the following modifications. The section and paragraph numbers are from those standards. Minimum thickness of metal. — The provisions of reference standard RS8-42 shall apply.

**Specific Modifications—Open Web Steel Joists**

**5.10 Inspection.**—

Delete this section.

**Specific Modifications—Longspan Steel Joists**

**104.11 Inspection.**—

Delete this section.

**RS 8-45** ACI 318 1963  
Building Code Requirements for Reinforced Concrete  
**Modifications.**—The provisions of ACI 318 1963 shall be subject to the following modifications. The section and paragraph numbers are from that standard, unless otherwise noted.

**101 Scope.**—

(a) Insert the words “plain and” after the words “construction of” in the second line.

(b) Delete this paragraph.

**104 Approval of special systems of design or construction.**—Delete this section and substitute the following: “Nothing in this article shall be construed to prohibit the use of any system of design, alternate to those indicated, provided that it can be demonstrated to the satisfaction of the building official that such system of design will provide a factor of safety against structural failure, fire safety, and such other characteristics pertinent to the safety of life, health, and property as prescribed in the Boston Code or as may be required by the building official. The building official may approve any system of construction which is not

covered by or which conflicts with the requirements of the Boston Code, on the basis of satisfactory experience records and tests as prescribed by sections 803 and 804 and sections 903 and 904. Whenever the code prescribes the use of a particular material, the building official may permit the use of any material shown to be equivalent for the use intended, in terms of health, fire, and/or structural safety. Nothing contained in this code shall be construed to require the use of any particular material for the purpose of meeting performance requirements of this code.”

**402** Add the following new paragraph:

(c) Special cements may be used subject to the approval of the building official. Such cements shall meet the requirements for Portland cement in regard to soundness, setting time and strength of the American Society for Testing and Materials for the particular type. Air-entraining cements shall produce a resultant air content in field mixtures at point of deposit not in excess of 5.0% when measured by means of an air meter in conformity with Standard Methods of Test for Determination of Air Content of Freshly Mixed Concrete by Pressure Method of the American Society for Testing and Materials.

**403** Add the following new paragraph:

(c) Concrete aggregates for which there are no standard specifications also may be employed in concrete for particular uses subject to the approval of the building official. Very lightweight aggregates such as pumice, expanded perlite, exfoliated vermiculite, weighing less than 40 pounds per cubic foot dry and loose may be employed only in non-structural concrete.

**406, 407 and 408 Admixtures.**—The requirements for the use of admixtures shall be in accordance with the three (3) previously cited sections as modified by the following:

“Admixtures, other than air-entraining and water-reducing agents, may be used only when batch plant observations are made by a representative of, or employee of, or other qualified individuals responsible to the architect or engineer who prepared the design drawings with said individual subject to the approval of the building official and the architect or engineer.



When admixtures are used, the provisions of reference standard RS8-45 shall apply except that water-reducing agents shall conform to reference standard RS8-69. Type A or D, with the requirements for compressive strength increased to one hundred ten (110) per cent (all ages) and for durability increased to one hundred (100) per cent. In addition, no anti-freeze agents shall be used. Admixtures shall be added only through calibrated dispensing devices. These dispensers shall be regularly inspected and certified as to accuracy by the manufacturer of the admixture.

**410** Specifications cited in this code\*.—

(a) Delete the asterisk and note applying to same.

**501** Add the following new paragraph:

(e) The provisions of this section apply to site-mixed concrete, ready-mixed concrete (either central or transit mixed) and to precast concrete made at a casting plant.

**502 Method of determining the proportions of concrete.**

—Delete the entire contents of this section except for the title and first sentence labeled “(a)” and substitute the following text whose section and paragraph numbers are not from the referenced national standard:

**502.1. Method I—Mixes with Minimum Cement Factor.**

**502.11. Minimum Cement Factor.**—The cement factor used in the work shall not be less than the factor given in table RS8-45-1 for the corresponding strength of concrete.

**Table RS8-45-1 Minimum Cement Factor**

Specified Compressive Strength in 28 Days (f'c)-psi	Minimum Bags of Cement Cubic Yard of Concrete (all aggregates)
2,000	5.00
2,500	5.25
3,000	5.75
3,500	6.50
3,750	6.75
4,000	7.00
5,000	7.50
Over 5,000	Permitted only by Method II

**502.12. Water-Cement Ratio.**—The concrete used in the work, whether proportioned on the basis of preliminary tests or of prequalified mix designs, shall be produced by using a water-cement ratio corresponding to a point on the strength vs. water-cement ratio curve representing (at a slump of five (5) inches  $\pm$  one (1) inch for concrete manufactured with gravel or stone aggregate and at a slump of four (4) inches  $\pm$  one (1) inch for concrete manufactured with lightweight aggregate) a strength of concrete at least twenty-five (25) per cent higher than the specified strength called for on the plans. The cement factor shall not be less than the factor shown in table RS8-45-1. The water-cement ratio shall not exceed the ratio shown in table RS8-45-2.

**Table RS8-45-2**

Maximum Permissible Water-Cement Ratios For Concrete (Method No. 1)

Specified compressive strength in 28 days, psi f'c	Maximum permissible water-cement ratio *			
	Non-air-entrained concrete		Air-entrained concrete	
	U.S. gal. per 94-lb. bag of cement	Absolute ratio by weight	U.S. gal. per 94-lb. bag of cement	Absolute ratio by weight
2500	7-1 4	0.642	6-1 4	0.554
3000	6-1 2	0.576	5-1 4	0.465
3500	5-3 4	0.510	4-1 2	0.399
4000	5	0.443	4	0.354

\*Including free surface moisture on aggregates.

**502.13. Preliminary Tests.**—Except as provided in section 502.14, preliminary tests of concrete shall be made in advance of the beginning of any concreting operation and shall be subject to certification. Preliminary tests shall consist of compressive strength tests of molded concrete cylinders made in accordance with reference standards RS8-64 and RS8-65. A curve representing the relation between the average strength of the concrete at twenty-eight (28) days, or at earlier periods, and the water-cement ratio shall be established for the range of strength values required for the work. The tests shall include at least four (4) different

water-cement ratios and at least four (4) cylinder specimens for each water-cement ratio. The cylinder strength tests shall be supplemented by tests to confirm that the cement and aggregates conform to the provisions of reference standard RS8-45.

**502.14. Prequalified Mixes.**—In lieu of the making of preliminary tests for individual buildings or groups of buildings, a concrete producer may provide concrete proportioned on the basis of prequalified or previously accepted mix designs, which designs, including the applicable batching weights and results of applicable preliminary tests and of tests to confirm that the cement and aggregates conform to the provisions of reference standard RS8-45, shall be submitted not less often than once a year to the building official for review and prequalification. The preliminary tests shall be made under the supervision of an architect or engineer engaged by the producer. Concrete proportioned according to prequalified mixes shall be produced only from batch plants satisfactory to the building official. Separate prequalification shall be required for mixes utilizing different combinations of aggregates and admixtures from all sources which are to be utilized.

**502.15. Quality Control and Certification of Materials and of Batching.**—Where concrete materials are used for structural elements, quality control and certification shall be provided at the batch plant for conformance to reference standards RS8-60 and in sufficient scope to:

- (1) Determine and record the actual batched weights and the water-cement ratios used;
- (2) Verify that such weights and ratios conform to the weights and proportions required by the preliminary test mix (or the prequalified mix) adjusted for moisture content and gradation of aggregates;
- (3) Verify conformance of the quality and condition of the materials to reference standard RS8-45.
- (4) Verify that the ingredients are the same or equal to those used for the preparation of the preliminary test or prequalifying mixes;
- (5) For all concrete, attestation of the results of the quality control and certification at the batch plant

shall appear on a ticket accompanying each load of concrete.

**502.2. Method II—Mixes Determined From Performance Data Performance Concrete.**

**502.21. Preliminary Tests.**—Preliminary tests of concrete shall be performed in accordance with the provisions of section 502.13. Mixes with performance data from previous projects, similarly proportioned, may be accepted in lieu of preliminary tests for the proposed project, subject to approval of the architect or engineer responsible for the design drawings and to approval by the building official, provided that acceptable performance data from such previous projects are submitted and the conditions of paragraph 502.24 below, are met.

**502.22. Performance Cement Factor.**—The cement factor used in the work shall be as determined in 502.23 below.

**502.23. Strength.**—

(1) Concrete manufactured with stone or gravel aggregate.—The concrete used in the work shall be produced using a water-cement ratio corresponding to a point on the strength vs. water-cement ratio curve representing a strength of concrete, at the design slump, at least twenty-five (25) per cent higher than the specified strength called for on the plans. However, if the producer demonstrates to the satisfaction of the architect or engineer responsible for the design drawings and the building official, on the basis of job performance records of the coefficient of variation (described in reference standard RS8-66) that the quality control exercised in the producer's plant warrants a change in the twenty-five (25) per cent factor, the change may be permitted. In no case, however, shall the concrete used in the work be produced using a water-cement ratio in excess of, or a cement factor less than, that corresponding to a point in the strength vs. water-cement ratio curve representing a strength of concrete, at the design slump, fifteen (15) per cent higher than the specified strength called for on the plans. The design slump shall be as specified by the architect or engineer responsible for the design drawings and the concrete shall be placed at a slump equal to or less than the design slump.

(2) Concrete manufactured with lightweight aggregate.—The concrete used in the work shall be proportioned on a strength vs. cement content basis at a given consistency in accordance with reference standard RS8-67 for a strength, at the design slump, at least twenty-five (25) per cent higher than the specified strength called for on the plans. The provision of (1) above relating to reduction in the strength requirement for demonstrable quality control shall apply.

**502.24. Materials.**—The cement, aggregates, admixtures and other ingredients of the concrete used for the individual building or group of buildings shall be the same and from the same sources as those in the preliminary tests or previously used mixes.

**502.25. Batching.**—The concrete shall be produced in a plant acceptable to the building official and concrete produced according to previous performance data shall be produced in a plant with automatic or semi-automatic batching maintaining documentation as required in section 842.1 of the Boston Building Code for all ingredients.

**502.26. Quality Control and Certification of Materials and of Batching.**—The provisions of 502.15 shall apply.

**502.27.**—Subaqueous concrete shall contain twenty (20) per cent more cement than previously required.

**504. Strength tests of concrete.**—

Delete paragraphs (a), (b) and (c) and substitute the following:

“(a) Whenever strength tests of concrete specimens are required by the provisions of the Boston building code, compression test samples shall be taken directly from the mixer in accordance with reference standard RS8-70 and cured in accordance with reference standard RS8-71 and tested at the age of 28 days in accordance with reference standard RS8-64. Three test cylinders shall be molded for each 150 cubic yards or fraction thereof of each class of concrete placed in any one day’s concreting. Additional specimens may be molded and tested where there is a question as to the required interval between placing of concrete and stripping of forms or placing the structure into use.

(b) The test cylinders shall be tested by an approved concrete testing laboratory. The testing of each batch

of three test cylinders shall be considered as one strength test. The strength of such test shall be the average of the breaking strengths of the three cylinders comprising the test except that, if one of the specimens shall show manifest evidence of improper sampling, molding, handling, or testing, it shall be discarded and the remaining two averaged. If more than one cylinder must be discarded, the entire strength test shall be voided.

(c) The average of any three consecutive strength tests representing each class of concrete shall be equal to or greater than the specified strength ( $f'c$ ) and not more than 10 per cent of the strength tests shall have values less than the specified strength, but no test shall show an average strength less than 85 per cent of the specified strength ( $f'c$ )."

(e) In the 6th line, change the words "as outlined in chapter 2" to the words "as described in the Boston Code for core tests and load tests of concrete construction."

Add new paragraph "(f) All strength tests of concrete and testing of concrete materials required by the provisions of the Boston Code shall be performed by approved concrete testing laboratories."

#### **604. Depositing. —**

At the end of paragraph (a), delete the words "unless approved by the engineer."

Add the following new paragraph:

(e) Subaqueous concrete shall be placed carefully by Tremie, covered bottom-dump-bucket, or other suitable means to minimize "wash" of cement or segregation of constituents. Subaqueous construction equipment, materials, and methods shall have the approval of the building official.

#### **605. Add the following new paragraph:**

(b) No blasting shall be carried out in the vicinity of the construction which will affect the resultant quality of the concrete after deposit.

#### **608. Add the following new section:**

##### **"Concrete Utilizing Preplaced Aggregate. —**

(a) The use of concrete formed by the injection of grout into a mass of preplaced coarse aggregate will be permitted where it can be demonstrated by successful prototype installation that the proposed mix, ma-

materials, and method of placement will produce a concrete of the specified strength and free of areas or inclusions of uncemented aggregate.

1. Prototypes.—At least two (2) prototypes, from either previous work or samples prepared for the proposed project shall be prepared. The forms shall be stripped, and a minimum of six (6) cores recovered and tested to demonstrate the strength of the concrete produced by the proposed materials and methods of installation. In addition, the homogeneity of the prototypes shall be demonstrated by demolishing the prototypes in the presence of the building official or his agent.

2. In-Place Concrete.—The concrete, as finally placed in the work, shall be prepared using the same materials, mix, equipment, and procedures utilized to prepare the successful prototype installations.

3. Cylinders.—All preparation and placement of structural concrete utilizing pre-placed aggregates shall be subject to certification. Compression test cylinders shall be prepared and tested as required for premixed concrete, except that the cylinders shall be prepared under conditions that will simulate the conditions under which the concrete in the work is installed.”

**703. Conduits and pipes embedded in concrete.**—Add the following paragraph:

“(c) No conduits, pipes, or other similar embedded items will be permitted in prestressed or post-tensioned concrete members other than as shown on the approved plans. Computations demonstrating the effects of such embedded items on the structural adequacy of prestressed or post-tensioned concrete members shall be submitted to the building official.”

**808.** Add the following sentence:

(a) The specified minimum coverage applies also at the bottom of rustications.

**902. Design loads.** and **903. Resistance to wind, earthquake and other forces.**—

Delete these sections. Building code requirements for loads shall apply.

**907. Effective depth of beam or slab.**—

At the end of paragraph (b) add the words “or provision shall be made to inhibit wear.”

**909. Control of deflections. —**

Add the following to paragraph (b):

“For flexural members of lightweight concrete the fractions given in table 909(b) shall be multiplied by the cube root of the ratio of 3,000,000 to the modulus of elasticity of the concrete being used.”

**912. Limiting dimensions of columns. —**

(a) Add the introductory phrase “Except for precast members.”

**1004. Allowable stresses. —**wind and earthquake forces.  
—Delete this section. Boston Code requirements for combination of loads shall apply.

Add the following paragraph to chapter 22:

**2204. Plain Concrete Walls —**

(a) The ratio of unsupported height to thickness or the ratio of unsupported length to thickness (whichever is the greater) for plain concrete walls shall not exceed 20.

(b) Plain concrete walls shall be proportioned so that the tensile stress does not exceed the allowable stress in concrete given in table 1002(a), and the allowable stress in compression shall be  $0.25f'_c$  for walls having a ratio of height to thickness of 10 or less, and shall be reduced proportionally to  $0.15f'_c$  for walls having a ratio of height to thickness of 20.

**2401. Scope. —**

Add the following paragraph:

“(b) The provisions of reference standard RS8-63 shall apply for thin-section precast members.”

- |                |  |      |
|----------------|--|------|
| <b>RS 8-46</b> | ASTM A377  | 1966 |
|                | Specifications for Cast Iron Pressure Pipe   |      |
| <b>RS 8-47</b> | ASTM A27   | 1965 |
|                | Specifications for Mild-To-Medium Strength Carbon-Steel Castings for General Application |      |
|                | ASTM A148  | 1965 |
|                | Specifications for High-Strength Steel Castings for Structural Purposes                  |      |
| <b>RS 8-48</b> | ASTM A48   | 1964 |
|                | Specifications for Gray Iron Castings  |      |
| <b>RS 8-49</b> | AA   | 1967 |
|                | Aluminum Construction Manual   |      |
| <b>RS 8-50</b> | NCMA   | 1968 |
|                | Specification for the Design and Construction of   |      |



Load-Bearing Concrete Masonry. Where conflict arises between this reference standard and the Boston Code, the more stringent requirements of the two shall apply.

**RS 8-51 Minimum and Empirical Thickness Requirements for Masonry Walls**

1.1. Minimum Thickness Requirements.— Whether proportioned on the basis of analysis of stresses in accordance with reference standards RS 8-50 and RS 8-58 or empirical rules contained herein, in no case shall the thickness of masonry construction be less than the dimensions shown in table RS 8-51-1. The minimum thickness of a wythe shall be two (2) inches.

**Table RS 8-51-1**

**Minimum Thickness of Masonry**

Type of Masonry	Nominal Thickness (Inches)
Loadbearing walls (exterior or interior)—	
Solid masonry.....	6
Grouted or filled cell masonry ...	6
Hollow masonry.....	6
Cavity or masonry bonded hollow walls .....	8 <sup>a</sup>
Stone ashlar masonry .....	12
Stone rubble masonry .....	16 <sup>c</sup>
Non-loadbearing walls—	
Exterior walls .....	4
Partitions.....	3
Columns—	
Solid unit masonry .....	6
Hollow unit masonry .....	8
Facing of faced walls .....	2 <sup>b</sup>

Notes—

- a Overall wall thickness including cavity.
- b In no case less than 1/8 the height of the facing unit.
- c Twelve (12) inches for one story buildings.

**1.11. Decrease in Thickness.**— Whether proportioned on the basis of empirical provisions or the analysis of stresses, where walls of hollow units or masonry

bonded hollow walls are decreased in thickness, a course or courses of solid masonry shall be interposed between the wall below and the thinner wall above, or special units or construction shall be used that will adequately transmit the loads from the shells of the units above to the shells of those below. Except for window-paneled backs, and permissible chases and recesses (section 838.0) walls shall not vary in thickness between their lateral supports. When a change in thickness, resulting from minimum thickness requirements, would occur between floor levels, the greater thickness shall be carried up to the higher floor level.

**2.1. Empirical Thickness Requirements for Loadbearing Walls.**—Where the height of exterior or interior loadbearing masonry walls does not exceed the following requirements, such walls, if they meet the provisions of reference standards RS 8-50 and RS 8-58 with regard to compressive stress and of table RS 8-51-1 with regard to minimum thickness, may be considered to be adequate to resist the applied wind loads and other shearing forces. All other provisions of this reference standard shall apply only to that masonry not designed under the provisions of reference standards RS 8-50 and RS 8-58.

**2.11. Multi-story Buildings.**—For limitations on 8 inch walls see (6) below.

**(1) Exterior solid walls.**—The thickness of solid exterior masonry bearing walls shall be at least 8 inches for the top floor and 12 inches for a maximum of 55 feet measured downward from the top floor level. Any additional height shall be provided by 16 inch lower walls up to a maximum building height of 104 feet. Buildings taller than 104 feet shall be structurally analyzed and designed. The slenderness ratio shall not exceed 20.

**(2) Interior solid walls.**—Interior solid walls shall be at least 8 inches thick for the uppermost 55 feet of wall height and 12 inches for the lower walls for

a maximum building height of 104 feet. Taller walls shall be designed by structural analysis.

**(3) Cavity walls.**—Cavity walls or masonry bonded hollow walls shall be at least 8 inches thick for the top floor and 12 inches thick for the lower walls up to a maximum total height of 40 feet except that 10 inch cavity walls may be used for a maximum total height of 25 feet. Taller walls shall be designed by structural analysis.

**(4) Walls of hollow units.**—Loadbearing walls of hollow units shall be at least 8 inches thick for the top floor and at least 12 inches for the lower walls for a maximum building height of 40 feet. Hollow unit walls 40 feet high may be supported by solid masonry walls whose height is no more than 35 feet above the first tier of beams.

**(5) Stiffened walls.**—Where solid masonry bearing walls are stiffened by, and tied to, reinforced concrete floors or masonry cross walls at distances not greater than 20 feet apart, they may be 12 inches thick for the uppermost 70 feet, measured downward from the top of the wall.

**(6) Eight inch walls.**—Notwithstanding other provisions in this section, the thickness of masonry bearing walls may be 8 inches where: (a) the total height of the wall above its support does not exceed 35 feet except for cavity walls for which (3) above shall apply; and (b) the distance from floor-to-floor or floor-to-roof does not exceed 12 feet; and (c) the floor live load does not exceed 60 psf; and (d) the roof is designed so that the dead load imparts no lateral thrust to the wall.

**2.12. One-Story Buildings.**—The bearing walls of one story buildings except as otherwise specifically provided for herein shall be at least 6 inches thick provided the vertical loads on the roof impart no lateral thrust to the wall.

**2.13. Walls of Residence Buildings.**—In residence buildings not more than three stories high, bearing walls other than coursed or rough or random rubble

stone, may be 8 inches thick when not over 35 feet high and the roof is designed so that the dead load imparts no lateral thrust to the wall. Such walls in one story residence buildings, and in one story private garages, may be 5-1/2 inches thick.

**2.14. Walls above Roof Level.**—Masonry walls above roof level, 12 feet or less in height, enclosing stairways, machinery rooms, shafts, or penthouses, may be 8 inches thick and may be considered as neither increasing the height nor requiring any increase in the thickness of the wall below. Parapet walls shall conform to the provisions of section 870.0.

**2.15. Faced or Composite Walls.**—Neither the thickness or height of faced or composite walls, nor the distance between lateral supports, shall exceed that prescribed for masonry of either of the types forming the facing or the backing.

**2.16. Cavity or Masonry Bonded Hollow Walls.**—Where both the facing and backing wythes are constructed of solid masonry units, the wythes may be 3 inches thick. Otherwise, the wythes of cavity walls shall each have a thickness of at least 4 inches and the cavity shall be at least 2 inches but not more than 4 inches wide. Wythes less than 4 inches thick shall not have raked joints and the backing wythe of cavity or masonry bonded hollow walls shall be at least as thick as the facing wythe. A cavity or masonry bonded hollow wall may be constructed to its maximum permissible height on top of a solid masonry wall whose maximum height is 35 feet above the first tier of beams. Roof construction shall be designed so that the dead load imparts no lateral thrust to the wall.

**2.17. Rubble Stone Walls.**—Rough, random, or coursed rubble stone walls shall be 4 inches thicker than is required for other types of masonry, but in no case less than 12 inches thick.

**2.18. Wall Thickness Increase Due to Span Length.**—When the clear span between bearing walls or between a bearing wall and an intermediate support is more than 26 feet, the effects of temperature, of rotation of end supports, and of eccentricity shall be investigated. In lieu of such investigation, the thickness of

such walls shall be increased 4 inches for each 12-1/2 feet or fraction thereof, that such span is in excess of 26 feet.

**2.2. Empirical Thickness Requirements for Non-Load-bearing Walls.**—Provided that they conform to the provisions of section 837.0, non-loadbearing masonry walls, including curtain walls and panel walls, may be 4 inches less in thickness than required in section 2.1 for loadbearing walls, except as provided below.

**2.21. Partitions.**—The minimum thickness for partitions shall be as follows:

Height of Walls	Thickness
8 feet and under .....	3 inches
Over 8 feet to 11 feet .....	4 inches
Over 11 feet to 16 feet .....	6 inches
Over 16 feet to 21 feet .....	8 inches
Over 21 feet to 27 feet .....	10 inches

- RS 8-52 ACI 506 1966  
Recommended Practice for Shotcreting
- RS 8-53 ANSI A59.1 1968  
Specifications for Reinforced Gypsum Concrete
- RS 8-54 APA 1967  
Design and Fabrication of Flat Plywood Stressed Skin Panels
- RS 8-55 USDC CS253 1963  
Structural Glued-Laminated Lumber
- RS 8-56 AITC 100-65 1965  
Timber Construction Standards
- RS 8-57 AITC 1966  
Timber Construction Manual Section 4
- RS 8-58 SCPI 1966  
Recommended Building Code Requirements for Engineered Brick Masonry. Where conflict arises between this reference standard and the Boston Code, the more stringent requirements of the two shall apply.
- RS 8-59 US Federal Spec. DD-G-451c 1968  
Glass, Plate, Sheet, Figured (Float, Flat for Glazing, Corrugated, Mirrors and Other Uses.)

## RS 8-60 ON SITE QUALITY CONTROL

The minimum extent of required on site certification of materials and methods of construction shall be as outlined in this reference standard. The certification shall be by an individual acceptable to the architect or engineer responsible for the design drawings and approved by the building official unless otherwise provided for in this Code. The certification when required shall be for conformance with all requirements of this Code and the reference standards.

### 1.0. Materials.—

**1.1. Controlled Materials.—**Evidence of the certification of all controlled materials furnished and used under the provisions of sections 201 and 722 shall be verified at the job site.

**1.2. All Other Materials and Assemblies.—**Evidence of all attestations, documents, and all other off site quality controls as may be required by any portion of the code shall be available and verified at the job site.

### 2.0. Methods of Construction.—

**2.1. Structural Steel.—**Welding operations and the tensioning of high strength bolts in connections where the calculated stresses in the welds or bolts are 50 per cent or more of basic allowable values and any other special connections as the building official may require.

**2.2. Concrete.—**All operations relating to the construction of all structural elements and assemblies.

#### 2.2.1. Exceptions.—

.1 Operations relating to the construction of members and assemblies (other than prestressed members) which involve the placement of a total of less than

50 cubic yards of concrete and provided that the concrete is used at levels of calculated stress less than 70 per cent of basic allowable values.

**.2 Placing of concrete for all:**

**.2.1** Short span floor and roof construction as per section 846.

**.2.2** Walls and footings for buildings in occupancy group L-3.

**.3** Size and location of reinforcement for walls and footings for buildings in occupancy group L-3.

**2.3. Aluminum.**—Welding operations in connections where the calculated stresses in the welds are 50 per cent or more of the basic allowable values and any other special connections as the building official may require.

**2.4. Wood.**—Fabrication of glued-laminated assemblies and of plywood components.

**2.5. Reinforced Masonry.**—Placement and bedding of units; sizes of members, including thickness of walls and wythes; sizes of columns; the size and position of reinforcement, in place, and provisions for curing and protection against freezing for all reinforced masonry construction; fabrication of pre-fabricated units.

**2.5.1. Exceptions.**—

**.1** All operations relating to the construction of members and assemblies which involve the placement of a total of less than 50 cubic yards of masonry and provided that this masonry is used at levels of calculated stress 70 per cent or less of basic allowable values.

.2 All masonry work for buildings in occupancy group L-3.

.3 All mixing of mortar.

**2.6. Unreinforced Masonry.**—Placement and bedding of units and sizes of members including thickness of walls and wythes; sizes of columns; and provisions for curing and protection against freezing for all masonry construction proportioned on the basis of structural analysis as described in reference standard RS 8-50.

**2.6.1. Exceptions.**—

.1 All operations relating to the construction of members and assemblies which involve the placement of a total of less than 50 cubic yards of masonry and provided that this masonry is used at levels of calculated stress 70 per cent or less of basic allowable values.

.2 All masonry work for buildings in occupancy group L-3.

.3 All mixing of mortar.

**2.7. Other.**—Requirements as may be established in other articles of this code or by the building official.

**RS 8-61** ANSI A108.1 1967  
Specifications for (Including Requirements of Related Divisions) Installation of Glazed Ceramic Wall Tile in Cement Mortars

ANSI A108.2 1967  
Specifications for (Including Requirements of Related Divisions) Installation of Ceramic Mosaic Tile in Cement Mortars



ANSI A108.3 1967  
Specifications for (Including Requirements of Related Divisions) Installation of Quarry Tile and Pavers in Cement Mortars

ANSI A94.1 1961  
Specifications for Interior Marble

ANSI A94.2 1961  
Specifications for Thin Exterior Marble Veneer (Two Inches and Less in Thickness)

ANSI A94.3 1961  
Specifications for Thin Exterior Marble in Curtain or Panel Walls

**RS 8-62** AWWA C2 1969  
Standard for the Preservative Treatment of Lumber, Timbers, Bridge Ties and Mine Ties by Pressure Processes

AWWA C9 1967  
Standard for the Preservative Treatment of Plywood by Pressure Processes.

AWWA C4 1969  
Standard for Preservative Treatment of Poles by Pressure Processes

**RS 8-63** ACI 525 1963  
Minimum Requirements for Thin-Section Precast Concrete Construction

**Modification.**—The provisions of ACI 525 1963 shall be subject to the following modification. The section and paragraph number is from that standard.

Admixtures.—

Delete last sentence of paragraph 8 and substitute the following:

“The use of other admixtures will be permitted provided they do not alter the intent of any section of these requirements or of reference standard RS8-45,

and provided their use is in accordance with pertinent information in "Admixtures for Concrete" reported by ACI Committee 212.

- RS 8-64** ASTM C39 1966  
Test for Compressive Strength of Molded Concrete Cylinders
- RS 8-65** ASTM C192 1969  
Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory
- RS 8-66** ACI 214 1965  
Recommended Practice for Evaluation of Compression Test Results of Field Concrete
- RS 8-67** ACI 211-2 1969  
Recommended Practice for Selecting Proportions for Structural Lightweight Concrete
- RS 8-68** ASTM C42 1968  
Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- RS 8-69** ASTM C494 1968  
Specifications for Chemical Admixtures for Concrete
- RS 8-70** ASTM C172 1968  
Sampling Fresh Concrete
- RS 8-71** ASTM C31 1969  
Making and Curing Concrete Compression and Flexure Test Specimens in the Field  
To section 6.(a) add the following:  
The following size cylinders will be permissible for the following nominal size aggregate:

<b>Size Cylinder</b>	<b>Size Aggregate</b>
6'' x 12''	2'' and smaller
4'' x 8''	1'' and smaller
3'' x 6''	1/2'' and smaller

For cylinders smaller than 6'' x 12'', evidence must be presented to relate their compressive strength number to that of the standard 6'' x 12'' cylinder.

- RS 8-72** ASTM C143 1969  
Test for Slump of Portland Cement Concrete
- RS 8-73** AWS D1.0-69 1969  
Code for Welding in Building Construction
- RS 8-74** AASHTO 1965  
Standard Specifications for Highway Bridges
- RS 8-75** ANSI Z26.1 1966  
Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways
- RS 8-76** NFoPA 1957  
Wood Structural Design Data

NFoPA 1968 (As amended 1967)  
National Design Specification for Stress-Grade Lumber and Its Fastenings.

**Modifications.**—The provisions of NFoPA 1968 National Design Specification for Stress-Grade Lumber and Its Fastenings shall be subject to the following modifications. The section and paragraph numbers are from that standard.

**Part I. General Requirements for Structural Design.**—  
**100-A Practice defined.**—Delete the second paragraph of 100-A-1 and substitute the following:

“In this specification the word “should” is to be considered as mandatory unless otherwise indicated in these modifications.”

**Part II. Allowable Unit Stresses for Stress-Grade Lumber.**—

**200-F Grade identification.**—Delete this section in its entirety.

**200-H-1 Other species and grades.**—Add the following standards:

“Machine stress rating as approved by the American Lumber Standards Committee.”

**203-A Increase in unit stresses.**—Add the following introductory paragraph:

“In lieu of the building code provisions for combination of loads, the provisions of this section shall apply.”

**Part III. Design Loads.**—

Delete this part in its entirety and substitute the following:

“The loads provisions of the Boston building code shall apply.”

**Part IV. Design Formulas and Provisions.**—

**400-C-6** Delete the first three sentences and substitute the following:

“Beams with notches shall be checked for stress at the notched section on the basis of net depth. Beams containing bored holes within 1-1/2 diameters of the top or bottom of the beam shall be treated as though notched to the depth of the inner extreme of the hole. In all cases the effects of notches or holes shall be accounted for in the design and reinforcement shall be supplied if required.”

**400-C-7** Change this section to read as follows:

“The lateral distribution of a concentrated load for moment from a critically loaded beam to adjacent parallel beams may be calculated by the method indicated in appendix A.”

**400-I-2** Delete this part and substitute the following:

“For bridging see section 855.6.1. of the Boston building code.”

**405 Timber-concrete composite construction.**—Delete this section in its entirety and substitute the following:

“**405 Composite timber-concrete construction**—Where the tensile strength of wood and the compressive strength of concrete are to be used compositely, the joining of the two materials shall be such as to resist all horizontal shear at the plane of junction and provisions shall be made to prevent separation of the wood from the concrete by the use of nails, grooves, or other suitable devices. The design shall be executed in accordance with the principles applicable to composite steel-concrete construction, as set forth in reference standard RS8-42. The resistance of shear con-

nectors shall be determined in accordance with the applicable provisions of the Boston building code requirements for load tests.”

**Part V. Timber Connector Joints.—**

**500-D-5** Change this paragraph to read:

“For connectors used in lumber, pressure-impregnated with fire-retardant chemicals, where the treated wood is kiln dried after treatment, the tabulated loads shall be reduced 10 per cent. Where the treated wood is not kiln dried after treatment, the load adjustments applicable to unseasoned wood shall apply.”

**Part VIII. Nail, Spike, Drift-Bolt, and Wood-Screw Joints.—**

**800-C-1** The “should” in this paragraph is advisory.

**Part IX. Mechanically Laminated Members.—**

The provisions of Part I to VIII shall be supplemented, as follows:

a. General.—

(1) Beams loaded perpendicular to the edges of the laminations (wide faces of laminations parallel to the direction of the load)—Mechanically laminated beams with full length laminations all of the same grade, shall be assumed to be as strong and stiff as sawn beams of the same external net dimension. Allowable stresses for members laminated of combinations of grades shall be limited to the allowable stress of the values assigned for the lowest grade used.

(2) Beams loaded perpendicular to wide faces of laminations.—Mechanically laminated beams with laminations horizontal shall be designed on the basis of specific placement of butt joints and test data pertaining to the particular construction with respect to butt joints, and on the basis of fastenings used to transfer shear between laminations.

b. Laminated trusses.—

(1) End joints in laminations.—End joints in outside laminations shall be located at panel points only. End joints shall not be located closer than 2 feet in adjacent laminations; they shall not be permitted in the first panel; and end joints in a given cross section shall be separated by at least two unspliced laminations. In chords of only four laminations, only one of

the outside laminations may have an end joint at a given panel point.

(2) Lamination bolts.—One or more 1/2 inch minimum diameter bolts, extending through all laminations, shall be placed at each panel point in order to distribute the loads, introduced by the web members, to all laminations.

(3) Axial compression.—The axial compression in a mechanically laminated chord shall be assumed to be resisted by simple column action of the individual laminations, or the entire section may be assumed to act as a mechanically laminated column. In the latter case for 2 inch nominal thickness laminations in panels up to 5 feet, full column action may be assumed; and for panel lengths of 5 feet to 8 feet, a straight line reduction from full column strength to 50 per cent of this value shall be used. Panel lengths over 8 feet shall not be used with 2 inch nominal thickness laminations. Proportionately longer panel lengths may be used with 3 inch nominal thickness laminations.

**RS 8-77** The type and amount of nails shown in the schedule below are the minimum amount required and shall be increased where necessary for structural adequacy.

#### MINIMUM NAILING SCHEDULE

Building Element	Nail Type	Number and Distribution
Stud to sole plate .....	Common-toe-nail	4—8d
Stud to cap plate.....	Common-toe-nail	2—16d
Double studs.....	Common-direct	10d 12'' o.c. or 16d 24'' o.c.
Corner studs .....	Common-direct	16d 24'' o.c.
Sole plate to joist or blocking.....	Common	16d 16'' o.c.
Double cap plate.....	Common-direct	16d 16'' o.c.
Cap plate laps .....	Common-direct	3—16d
Ribbon strip—6'' or less	Common-direct	2—10d ea. bearing
Ribbon strip—over 6''.	Common-direct	3—10d ea. bearing
Roof rafter to plate .....	Common-toe-nail	3—16d
Roof rafter to ridge .....	Common-toe-nail	2—16d
Jack rafter to hip .....	Common-toe-nail	3—10d
Floor joists to studs. (no ceiling joist).....	Common-direct	5—10d or 3—16d

Building Element	Nail Type	Number and Distribution
Floor joists to studs..... (with ceiling joists) ...	Common-direct Common-direct	2—10d 2—10d
Floor joists to sill or girder .....	Common-toe-nail	3—8d or 2—16d
Double joist to joist.....	Common-direct	10d stgd. @ 16" o.c.
Ledger strip .....	Common-direct	3—16d at ea. joist
Ceiling joists to plate ...	Common-toe-nail	2—16d
Ceiling joists (laps over partition).....	Common-direct	3—16d
Collar beam .....	Common-direct	4—10d
Bridging to joists.....	Common-direct	2—8d ea. end
Bridging to studs.....	Common-direct or toe	2—10d ea. end
Diagonal brace (to stud and plate).....	Common-direct	2—8d ea. bearing
Tail beams to headers (when nailing permitted) .....	Common-end	1—20d ea. 4 sq. ft. floor area
Header beams to trimmers (when nailing permitted).....	Common-end	1—20d ea. 8 sq. ft. floor area
1" Sub-flooring (6" or less).....	Common-direct	2—8d ea. joist
1" Sub-flooring (8" or more) .....	Common-direct	3—8d ea. joist
2" Sub-flooring .....	Common-direct	2—16d ea. joist
1" Wall sheathing (8" or less in width).....	Common-direct	2—8d ea. stud
1" Wall sheathing (over 8" in width).....	Common-direct	3—8d ea. stud
Plywood Roof and Wall Sheathing		
1/2" or less .....	Common-direct	6d—6" o.c. edges and 12" o.c. intermediate
5/8" or greater.....	Common-direct	8d—6" o.c. edges and 12" o.c. intermediate
5/16", 3/8", 1/2"	16 ga. galvanized wire staples. 3/8" minimum crown. Length of 1" plus plywood except 1-1/4" for 5/16" plywood.	4" o.c. edges and 8" o.c. intermediate
Plywood Sub-flooring		
1/2".....	Common-direct	6d—6" o.c. edges and 10" o.c. intermediate
5/8", 3/4", 7/8".....	Common-direct	8d—6" o.c. edges and 10" o.c. intermediate

Building Element	Nail Type	Number and Distribution
1", 1-1/8".....	Common-direct	10d or 8d ring shank —6" o.c. edges and 6" o.c. intermediate
1 1/2".....	16 ga. galvanized wire staples. 3/8" min. crown	4" o.c. edges and 7" 7" o.c. intermediate
5/8".....	1-5/8" length	2-1/2" o.c. edges and 4" o.c. intermediate
1" Roof decking (6" or less in width).....	Common-direct	2—8d ea. rafter
1" Roof decking (over 6" in width).....	Common-direct	3—8d ea. rafter
Built-up girders and beams.....	Common-direct	20d at 32" o.c.
Continuous header to stud.....	Common-toe-nail	4—8d
Continuous header— two pieces.....	Common-direct	16d at 16" o.c.
1 1/2" Fiberboard sheathing.....	1-1 1/2" galvanized Roofing Nail 6d Common Nail 16 gage galvan- ized staple. 1-1/8" long with mini- mum crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
25 3/2" Fiberboard sheathing.....	1-3 1/4" Galvani- zed Roofing Nail 8d Common Nail 16 gage galvan- ized staple, 1-1 1/2" in. long with min- imum crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
Gypsum sheathing.....	12 gage 1-1 1/4" Large head Cor- rosion-resistive	4" o.c. on edge 8" o.c. intermediate
Shingles— wood.....	Corrosion-resistive	2— No. 14 B&S each bearing
Weather boarding .....	Corrosion-resistive	2—8d ea. bearing



**Ceiling Joist Nailing To Every Rafter**  
(Number of 16d Nails)

Slope of Roof	4/12	5/12	6/12	7/12	9/12	12/12
Rafter spacing, o.c. (in.)	16 24	16 24	16 24	16 24	16 24	16 24
Width of building						
Up to 24 ft .....	5 8	4 7	3 5	3 4	3 3	3 3
24 to 30 ft .....	7 11	6 9	4 7	3 6	3 4	3 3

Shingle nails shall penetrate not less than 3/4 inch into nailing strips, sheathing or supporting construction except as otherwise provided in section 855.3.4.

## RS 8-78 EMPIRICAL PROVISIONS FOR WOOD FRAME CONSTRUCTION

**Empirical Provisions in Lieu of Design.**—The provisions of this reference standard may be used in lieu of structural analysis only for those buildings in occupancy group L-3 where the specific occupancies correspond to a live load requirement of 40 psf, or less, and to constructions wherein the supporting framing consists of multiple, closely spaced members, such as joists, studs, platform or balloon frames. All requirements established in this reference standard may be reduced when an analysis of stresses, executed in accordance with reference standard RS8-76 indicates such reduction is feasible.

### 1.1. Stud Walls and Partitions.—

**1.1.1.** Studs shall be of equivalent or better grade than the minimum grades for the various species as established in reference standard RS8-76.

**1.1.2.** Corner posts shall be 3-stud members or members of equivalent strength.

**1.1.3.** Load bearing studs shall be set with the larger cross section dimension perpendicular to the wall or partition. Studs in exterior walls of one story buildings of construction class type 4 shall be at least 2 inches x 4 inches spaced not more than 24 inches on center. Studs for other classes of construction or multiple story buildings shall be at least 2 inches x 4 inches spaced not more than 16 inches on center.

**1.1.4.** Stud walls resting on concrete or masonry shall have sills at least 2 inches in nominal thickness. Where such sills bear on concrete, they shall be fastened with minimum 1/2 inch bolts embedded at least 6 inches. Each sill piece shall have at least two anchor bolts, with one bolt located at least 1 inch from each end of the plate, and with intermediate spacing not more than 8 feet. Where such sills bear on masonry, they shall be anchored in accordance with the applicable provisions of article 8.

**1.1.5.** Stud partitions that rest directly over each other and are not parallel to floor joists or beams may extend down between the joists and rest on the top plate of the partition, partition girder, or foundation below, or may be constructed on sill plates running on top of the beams or joists.

**1.1.6.** All load bearing stud partitions shall be supported on walls, other partitions, double joists or beams, solid bridging, or on beams at least as wide as the studs. Joists supporting a partition parallel to the joists wherein the joists are spaced apart to permit the passage of piping or duct work shall be provided with solid blocking at intervals of not more than 16 inches.

**1.1.7.** Load bearing partitions perpendicular to joists shall not be offset from supporting girders, walls, or partition by more than the depth of the joists unless the joists are proportioned on the basis of analysis of stress.

**1.1.8.** In interior walls and in bearing partitions, double studs shall be provided at the sides of openings that are greater than 3 feet-6 inches up to 6 feet in width, and triple-studs shall be provided at the sides of openings of greater width.

**1.1.9.** Headers shall be provided over each opening in exterior walls and bearing partitions. Where the opening does not exceed 3 feet each end of the header shall be supported on a stud or framing anchor. Where the opening exceeds 3 feet in width each end of the header shall be supported on one stud and where the opening exceeds 6 feet each end shall be supported on two studs.

**1.1.10.** All studs in exterior walls and in bearing partitions shall be capped with double top plates installed to provide overlapping at corners and at intersections with other walls and bearing partitions. End joints in double top plates shall be offset at least 24 inches. In lieu of double top plates, a continuous header of similar dimensions may be used. For platform frame construction, studs shall rest on a single bottom plate.

**1.2. Bracing of exterior walls.**—Exterior stud walls shall be braced by 1 inch x 4 inch continuous diagonal strips let into the face of the studs and into the top and bottom plates at each corner of the building. Bracing may also be provided by one of the following means:

**1.2.1.** Wood board sheathing of 1 inch nominal thickness, applied diagonally.

**1.2.2.** For one and two-story dwellings, plywood sheathing at least 4 feet x 8 feet (except where cut to fit around openings and for similar purposes) and at least 5/16 inch thick on studs spaced 16 inches or less on centers and at least 3/8 inch thick on studs spaced more than 16 inches but not exceeding 24 inches on centers.

**1.2.3.** For one story dwellings and for the upper story of two story dwellings, fiberboard sheathing applied vertically in panels at least 4 feet x 8 feet (except where cut to fit around openings and for similar purposes). Fiberboard sheathing shall be at least 1/2 inch in thickness and shall conform to the provisions of reference standard RS8-80.

**1.2.4.** For one story dwellings and for the upper story of two story dwellings, gypsum board sheathing applied horizontally in panels at least 2 feet x 8 feet (except where cut to fit around openings and for similar purposes). Gypsum boards shall be at least 1/2 inch thick and shall conform to the provisions of reference standard RS8-39.

**1.3 Floor and roof framing.**—

**1.3.1. Span tables.**—Joists and rafters may be used in accordance with reference standard RS8-81.

**1.3.2. Bridging.**—See section 855.6.1.

**1.3.3. Notches.**—See section 853.3.3. In addition, for stair stringers, the minimum effective depth of the wood at any notch shall be 3-1/2 inches unless the stringer is continuously supported on a wall or partition.

**1.3.4. Support.**—

.1 Floor or roof framing may be supported on stud partitions.

.2 Tail beams over 12 feet long and all header and trimmer beams over 6 feet long shall be hung in metal stirrups having anchors, or by other methods providing adequate support. Trimmers and headers shall be doubled where the header is 4 feet or more in length.

.3 Except where supported on a 1 inch x 4 inch ribbon strip and nailed to the adjoining stud, the ends of floor joists shall have at least 1-1/2 inch of bearing on wood or metal, nor less than 4 inches on masonry.

.4 Joists framing from opposite sides of and supported on a beam, girder, or partition shall be lapped at least 4 inches and fastened, butted end-to-end and tied by metal straps or dogs, or otherwise tied together in a manner providing adequate support.

.5 Joists framing into the side of a wood girder shall be supported by framing anchors, on ledger strips at least 2 inches x 2 inches, or by equivalent methods.

.6 Wood joists and rafters bearing on masonry walls shall be anchored to such walls in accordance with the applicable provisions of article 8.

**1.3.5. Rafters and Ceiling Joists.**—

.1 Where rafters meet to form a ridge, they shall be placed directly opposite each other and nailed to a ridge board at least 1 inch thick, and not less than the cut end of the rafters in depth.

.2 Provisions shall be made to resist the thrust from inclined rafters by connection of collar beams at least 1 inch x 6 inches, by connection to joists, or by equivalent means.

.3 Where ceiling joists are not parallel to rafters, subflooring or metal straps attached to the ends of the rafters shall be installed in a manner to provide a continuous tie across the building.

.4 Ceiling joists shall be continuous, or where they meet over interior partitions, shall be securely joined to provide a continuous tie across the building.

.5 Valley rafters shall be double members. Hip rafters may be single members. Valley and hip rafters shall be 2 inches deeper than jack rafters.

.6 Trussed rafters shall be designed in accordance with the provisions of reference standard RS8-76.

1.3.6. Built-up members shall be securely spiked or bolted together and provision shall be made to resist the horizontal shear between laminations.

1.3.7. **Nailing schedule.**—The size and number of nails for connections shall be in accordance with reference standard RS8-77.

- RS 8-79** USDC CS31 1952  
Wood Shingles (Red Cedar, Tidewater, Red Cypress and California Redwood)
- RS 8-80** ASTM D2277 1966  
Specifications for Fiberboard Nail-Base Sheathing
- RS 8-81** NFoPA 1966  
Simplified spans for Joists and Rafters in Residential Construction



**FIRERESISTIVE CONSTRUCTION REQUIREMENTS**

900.0	Scope	917.0	Fire Doors
901.0	Definitions	918.0	Fire Windows and Shutters
902.0	Fire Hazard Division Classification	919.0	Wired Glass
903.0	Fireresistance Tests	920.0	Fireresistive Requirements for Plaster
904.0	Flame Resistance Tests	921.0	Firestopping
905.0	Special Fireresistive Requirements	922.0	Interior Finish and Trim
906.0	Enclosure Walls	923.0	Application of Interior Finish
907.0	Fire Walls and Party Walls	924.0	Combustible Materials Permitted in Floor Construction of Type 1 and Type 2 Buildings
908.0	Fire Wall or Vertical Type A Fire Division Openings	925.0	Omitted
909.0	Fire Partitions	926.0	Restrictions of Exterior Appendages and Trim
910.0	Fireresistive Partitions and Type B Fire Divisions	927.0	Roof Structures
911.0	Vertical Shafts and Hoistways	928.0	Roof Coverings
912.0	Wall Lintels	RS 9	Reference Standards
913.0	Beams and Girders		
914.0	Columns		
915.0	Trusses		
916.0	Exterior Opening Protectives		

**TABLES**

9-1	902.4	Type B Fire Divisions (Separations)
9-2	902.4	Type A Fire Divisions
9-3	908.3.1	Opening Protectives for Fire Walls and Fire Divisions
9-4	922.1.2	Interior Finish Flame Spread Limit Requirements

**SECTION 900.0. SCOPE**

The provisions of this article shall govern the use and assembly of all materials of construction with respect to fireresistance, flame spread resistance, and smoke and toxic fume limitation. The provisions shall also control the location and function of integral structural and fire protective elements of buildings, and provide for the installation of safeguards against the spread of fire within buildings and between buildings. The provisions of the reference standards RS-9 shall be a part of this article.

**900.1. Performance Standards.**—The requirements of this article shall constitute the minimum functional performance standards for fire-protection purposes; and shall not be deemed to decrease

or waive any strength provisions or in any other manner decrease the requirements of this code in respect to structural safety.

**900.2. Use of Combustibles.**—All materials and forms of construction that develop the fireresistance required by this code shall be acceptable for fireproofing and structural purposes; except that the use of combustible component materials in structural units or structural assemblies shall be limited to type 3 and type 4 construction except as follows:

**900.2.1. Combustible Components.**—Combustible aggregates may be incorporated in concrete mixtures approved for fire-resistive construction as provided in sections 811 and 850 for gypsum concrete, in section 845 for cinder concrete and any other approved component material or admixture may be used in assemblies that meet the fireresistive test requirements of this code; and wood nailing strips or any other material of similar combustible characteristics may be embedded in concrete and masonry construction for securing trim and finish.

**900.2.2. Filler Units.**—When not included in strength calculations, filler units that contain component combustible materials may be used in all fire-resistive floor construction provided the complete assembly meets the required fire test performance.

**900.3. Reinforced Concrete.**—All reinforced concrete mixtures which meet the requirements of section 817 for concrete aggregates and the provisions of this article for time-temperature performance shall be accepted in fire-resistive construction and shall be classified in accordance with the degree of fireresistance required in article 2 and in section 221.1 table 2-1 and section 221.2 table 2-2.



## **SECTION 901.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.0.

## **SECTION 902.0. FIRE HAZARD DIVISION CLASSIFICATION**

Fire hazard division classification of buildings and structures for the segregation of occupancies or spaces by fire divisions as prescribed in section 213 shall be as specified in sections below except as modified in article 6.

**902.1. Segregation by Type A Fire Divisions.**—When different occupancies are to be segregated by fire divisions under the provisions of section 213, the occupancies shall be separated from each other, vertically and horizontally, by Type A fire divisions having at least the fire-resistance ratings listed in section 902.4 table 9-2 for the occupancy groups involved. Every building section shall be constructed of elements having at least the fire-resistance rating of a construction class required for the area and height of the building section as listed in section 221.1 table 2-1 and section 221.2 table 2-2.

**902.2. Segregation by Type B Fire Divisions.**—When different spaces are to be segregated under the provisions of section 213, the occupancies shall be separated from each other, vertically and horizontally, by fire separations having at least the fire-resistance ratings listed in section 902.4 table 9-1. In buildings of construction types I and II, Type B Fire Divisions shall be constructed of noncombustible materials.

**902.3. Unclassified Uses.**—The building official shall determine the fire hazard classification of a building or structure designed for a use not specifically provided in section 902.4 tables 9-1 and 9-2 in accordance with the fire characteristics and potential fire hazard of the occupancy group which it most nearly resembles; or its designation shall be fixed by the approved rules.

**902.4. Required Fireresistance Rating for Fire Divisions.**

### 902.4. Required Fire Resistance Rating for Fire Divisions

Table 9-1 (Above heavy stepped line) Type B Fire Divisions (Separations)

Fire Grading	Occu-pancy	A	B-1	B-2	C	D-1	D-2	E	F-1a	F-1b	F-2	F-3	F-4	F-5	G	H-1	H-2	L-1	L-2	L-3
4	A	4	N	N	2d	N	N	2a	2	2	2	2	2	—	2	2	2	2	2	2
3	B-1	4	3	N	1bc	N	N	1ac	1c	1c	1c	1c	1c	—	1c	1½c	1½c	1c	1c	1c
2	B-2	4	3	2	N	N	N	N	N	N	N	N	N	—	N	N	N	N	N	N
2	C	4	3	2	2	1	N	N	N	N	N	N	N	—	N	1	1	1	1	1
3	D-1	4	3	3	3	3	N	1a	1	1	1	1	1	—	1	1½	1½	1	1	1
2	D-2	4	3	2	2	3	2	N	N	N	N	N	N	—	N	N	N	N	N	N
2	E	4	3	2	2	3	2	2	N	N	N	N	N	—	N	1a	1a	1a	1a	1a
2	F-1a	4	3	2	2	3	2	2	2	N	N	N	N	—	N	1	1	1	1	1
2	F-1b	4	3	2	2	3	2	2	2	2	N	N	N	—	N	1	1	1	1	1
2	F-2	4	3	2	2	3	2	2	2	2	2	N	N	—	N	1½	1½	1	1	1
2	F-3	4	3	2	2	3	2	2	2	2	2	2	N	—	N	1	1	1	1	1
2	F-4	4	3	2	2	3	2	2	2	2	2	2	2	—	N	N	N	N	N	N
2	F-5	4	3	2	2	3	2	2	2	2	2	2	2	2	—	—	—	—	—	—
2	G	4	3	2	2	3	2	2	2	2	2	2	2	2	2	N	N	N	N	N
2	H-1	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	N	1	1	1
2	H-2	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	L-1	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	L-2	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	L-3	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fire Grading	Occu-pancy	A	B-1	B-2	C	D-1	D-2	E	F-1a	F-1b	F-2	F-3	F-4	F-5	G	H-1	H-2	L-1	L-2	L-3

Table 9-2 (Below heavy stepped line) Type A Fire Divisions

a See section 902.5.1  
 b See section 902.5.2  
 c See section 902.5.3  
 d See section 902.5.4  
 Fire resistance ratings are given in hours  
 N— No requirement

**902.5. Notes for Table 9-1.**

**902.5.1.** An office, or group of offices, whose use is accessory to an occupancy, and totals four hundred (400) square feet or less in area shall not be required to be separated with a type B Fire Division. Such office, or group of offices, totalling more than four hundred (400) square feet in area shall not be required to be separated with a type B Fire Division if such offices exit directly without having to pass through the area of the related occupancy.

**902.5.2.** Counters and backbars for the sale of publications, tobacco products, liquors, or candies, or for making of reservations for travel, car rental, or theatre, or otherwise involving similar business and mercantile activities that are accessory to an occupancy and are limited in area to one hundred (100) square feet within the area of the occupancy, need not comply with the requirements of this table.

**902.5.3.** The provisions of this table shall not apply to closets seventy-five (75) square feet or less in area.

**902.5.4.** Nonresidential kitchens shall be separated by fire divisions from adjoining dining spaces except when the following conditions are complied with:

- a. The cooking equipment is vented directly to the outdoors, and
- b. A draft curtain of noncombustible material, at least twenty-four (24) inches down from the ceiling, is provided to separate the cooking facilities from dining spaces, and
- c. Sprinkler heads constructed in accordance with the provisions of article 12 are provided on the cooking facilities side of the curtain, or any opening between the kitchen and dining space, located within twenty-four (24) inches of the curtain or opening, and spaced not more than forty-eight (48) inches on centers if the opening is more than sixty (60) inches wide. When fire separations consisting of type B fire divisions are provided, double-action doors may be permitted.

**SECTION 903.0. FIRERESISTANCE TESTS**

All fire tests of building materials and construction shall be conducted in accordance with the applicable fire test procedure as specified herein; except that the hose-stream test therein pre-

scribed for one (1) hour construction shall be required for all assemblies and constructions approved for a fireresistance rating of three-quarter (3/4) hours. The fireresistance rating of materials and assemblies listed in reference standard RS 9-1 may be used to determine conformance with the fireresistance requirements of this code. In addition to the performance results, test reports shall give all technical data pertaining to the nature of the constituent materials, such as the physical properties, chemical composition and properties, coefficient of expansion, thicknesses of materials, etc. Except as listed in reference standard RS 9-1, any assembly using a component having a structural base of noncombustible material covered with an integrally manufactured combustible surfacing material, shall have an approved fireresistance rating.

**903.1. Structural Building Assemblies.**—Built-up masonry units and composite assemblies of structural materials including walls, partitions, columns, girders, beams and slabs and assemblies of slabs and beams or other combinations of structural units for use in floor and roof construction shall be regulated by the fireresistance ratings of section 221.1 table 2-1 based on the test procedures of reference standard RS 9-2.

**903.2. Protection of Unoccupied Space.**—Where a fireresistance rating is required for floor and roof assemblies, the ceiling may be omitted over unusable space and flooring or decking of the tested assembly may be omitted where unusable enclosed space occurs above provided the fireresistance of the assembly is not reduced to less than one (1) hour.

**903.3. Column, Beam and Girder Protection.**—To evaluate column, beam and girder protection for structural units when the fireproofing is not a structural part of the element, in lieu of full size tests of loaded specimens, the structural sections encased in the material proposed for use as insulation and fire protection may be subjected to the standard test procedure without load.

**903.4. Roof Coverings.**

**903.4.1. Size of Specimen.**—Roof coverings shall be tested in a complete assembly of roof deck and roof covering constructed and applied as in practice with a panel area of not less than twelve (12) square feet and no dimension less than thirty-two (32) inches.

**903.4.2. Test Procedure.**—The tests shall be conducted to determine ability to resist ignition, duration of flaming and susceptibility to fire spread.

**903.5. Classification of Roof Coverings.**—Roof coverings shall be classified as A, B or C on the basis of their resistance to exterior fire exposure as listed in reference standard RS 9-3 or as determined by tests made in conformance with reference standard RS 9-4 for those not listed.

**903.5.1. Limitations of Use.**—Every roof placed on a building shall be covered with Class A or B roof covering, except that Class C roof covering may be placed on buildings classified in Occupancy Group L when not more than three (3) stories or forty (40) feet in height, and on buildings permitted by this code to be of type 4A or 4B construction.

**903.5.2. Combustible Roof Decking.**—Unless attached directly to noncombustible framework, all roof covering shall be applied to a closely fitted deck.

**903.5.3. Roof Insulation.**—Approved combustible roof insulation may be applied on top of roof decking or slab provided that it is protected with the roof covering applied directly thereto.

**903.5.4. Wood Shake or Wood Shingle.**—Roofing shall be limited to use in areas outside of the fire limits where the exterior fire exposure hazard is reduced by required fire separations as provided in section 928.3 and on frame (type 4B) construction.

**903.6. Opening Protectives.**

**903.6.1. Structural Integrity.**—Opening protectives, including frames, self-closing devices, and hardware, shall be classified as to fire-protection rating in accordance with the test procedures of reference standards RS 9-5 and RS 9-6, and shall be installed, maintained, and operated in accordance with the provisions of reference standard RS 9-7. All opening protectives shall bear the identification of an approved testing laboratory or agency certifying to the performance rating thereof, in accordance with the acceptance requirements of article 1.

**903.6.2. Smoke and Flame Barrier.**—Tests of door and window assemblies shall be considered unsuccessful unless the assembly prevents the passage of smoke or flames in considerable volume and remains securely in the opening during the fire exposure and following the hose-stream test.

**903.6.3. Labeled Fire Doors.**—Opening protective assemblies including the frames, hardware and operation which comply with the standards and accepted practice, including shop inspection, of an approved testing laboratory or agency, shall be

deemed to meet the requirements of this code for their recommended and approved locations and use as listed in section 917.

**903.6.4. Door Openings More Than 120 Square Feet.**—Labeled fire doors for openings which are more than one hundred and twenty (120) square feet in area may be approved as conforming to all the standard construction requirements of tested and approved fire door assemblies except as to size.

**903.6.5. Labeled Fire Windows and Shutters.**—Fire window assemblies and shutters which comply with section 918, and the standards and accepted practice of the Underwriters' Laboratories, Inc., or other approved testing authorities shall be deemed to meet the requirements for their recommended and required locations under this code.

**903.6.6. Labeled Fire Dampers.**—Only fire dampers which have been tested, listed and labeled by Underwriters' Laboratories, Inc., or an equivalent test and labeling by other approved testing laboratories shall be deemed to meet the requirements of this code for the recommended locations and use as listed in section 1812.1.

**903.7. Combustibility Tests.**—Where the behavior of materials under exposure to fire is specified in this Code the characteristics of materials shall be determined by the following tests and criteria.

**903.7.1. Noncombustible Materials.**—A noncombustible material is one which, in the form in which it is used, meets any of the following requirements:

- a. Materials which pass the test procedure for defining noncombustibility of elementary materials listed in reference standard RS 9-8 when exposed to a furnace temperature of thirteen hundred eighty-two (1382) degrees F. for a period of five (5) minutes, and do not cause a temperature rise of the surface or interior thermocouples in excess of fifty-four (54) degrees F. above the furnace air temperature at the beginning of the test and which do not flame after an exposure of thirty (30) seconds.
- b. Materials having a structural base of noncombustible material as defined in paragraph a., with a surfacing not more than one-eighth (1/8) inch thick which has a flame-spread rating not greater than fifty (50) when tested in accordance with the method of test for surface burning characteristics of building materials listed in reference standard RS 9-9.

- c. Materials other than defined in paragraphs a. and b., having a flame-spread rating not greater than twenty-five (25) without evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material in any way would not have a flame-spread rating greater than twenty-five (25) when tested in accordance with method of test for surface burning characteristics of building materials listed in reference standard RS 9-9.
- d. The term noncombustible does not apply to the flame-spread characteristics of interior finish or trim materials. No material shall be classed as noncombustible building construction material which is subject to increase in combustibility or flamespread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

**903.7.2. Fire-Retardant Treated Wood Tests.**—Where permitted for use as a structural element, fire-retardant treated wood shall be tested in accordance with the standard method of test for surface burning characteristics of building materials (tunnel test) listed in reference standard RS 9-9 and shall show a flame-spread rating not greater than twenty-five (25) when exposed for a period of not less than thirty (30) minutes, with no evidence of significant progressive combustion. The material shall bear the identification of an approved authoritative testing agency showing the performance rating thereof.

**903.8. Fire-Retardant Treated Wood.**—Wood that has been pressure treated with fire-retardant chemicals in accordance with reference standards RS 9-10 or RS 9-11 may be used in type 1 and 2 constructions for non-bearing partitions, structural elements, roof framing and sheathing, in accordance with Note 6, as indicated by note in section 221.1 table 2-1 provided that the assembly in which such material is used shall produce the required fireresistance when tested in accordance with reference standard RS 9-2.

**903.8.1. Limitations.**—Fire-retardant treated wood may not be used where exposed to the weather or in interior spaces where the relative humidity is normally eighty (80) per cent or more. There shall be no fabrication of the material after treatment, such as cutting, shaping or grooving for splines or ring connectors so as to expose untreated surfaces, except that the material may be cut to length, shaped, or grooved if the ex-

posed surfaces or edges are tightly butted against other material that is noncombustible or that is fire retardant treated, so that no untreated wood is left exposed to danger of ignition. Holes may be bored or cut for plumbing or heating pipes and for electric outlets only if the openings are covered with tightly-fitted noncombustible escutcheons or cover plates. The allowable working stresses of the material shall be ninety (90) per cent of the allowable stresses for untreated lumber of like classification.

**903.8.2. Structural Elements.**—Where used as a structural element or as furring, such material shall meet the requirements of section 903.7.2.

**903.8.3. Interior Finish.**—Where used as interior finish or trim, such material shall meet the requirements of section 904.1.

**903.8.4. Area Increase.**—Fire-retardant treated wood may be used in construction types 3A, 3B and 4A buildings in lieu of untreated wood for wall studs, bearing partition studs, columns, beams, girders, joists, rafters, trusses, sole and cap plates, subflooring and roof decks and when so used, the area limitations of section 221.1 table 2-1 for buildings of construction type 3A, 3B and 4A may be increased by thirty-three and one-third (33-1/3) per cent.

## **SECTION 904.0. FLAME RESISTANCE TESTS**

All materials which are required to restrict the spread of flame or to be flame resistant under the provisions of this code, including but not limited to interior finish materials, fireretardant treated wood, tents and tarpaulins, and interior hangings and decorations, shall meet the requirements for their respective use and classifications as determined by the applicable test procedures listed herein.

**904.1. Interior Finish Materials.**—All materials used for interior finish shall be classified in accordance with the surface flame-spread rating obtained as prescribed in the provisions of reference standard RS9-9. Where an interior finish material is comprised of two (2) or more materials, laminated, glued, nailed or otherwise secured together, the test rating for flame spread shall be based upon the composite of the materials in the form in which it will be used in construction. Interior finish materials shall



be grouped in the following classes, in accordance with their surface flame spread characteristics:

Interior Finish Class	Flame-Spread Rating
A	0 to 25
B	26 to 75
C	76 to 225
D	226 to 500

## SECTION 905.0. SPECIAL FIRERESISTIVE REQUIREMENTS

In buildings or parts thereof of the occupancies and types of construction herein specified, the general fireresistive requirements of section 221.1 table 2-1 and the height and area limitations of section 221.2 table 2-2 shall be subject to the following exceptions and modifications, and to Massachusetts Department of Public Safety, Board of Fire Prevention Regulations Form FPR No. 4.

**905.1. Public Garages.**—Subject to the approval of the building official, existing buildings and structures altered or converted for use to a garage, motor vehicle repair shop or gasoline service station, more than one (1) story in height, unless of fireproof (type 1) construction, or heavy timber (type 3-A) construction, shall have the partitions, columns and girders and all floor and roof construction protected and insulated with noncombustible materials or assemblies of component materials having a fireresistance rating of not less than three-quarter (3/4) hours; except that existing roof trusses shall be exempt from all fireproofing requirements.

**905.2. Open Parking Structures.**—For general construction requirements, see section 430.

**905.2.1.**—Open parking structures shall be provided with stand-pipe in accordance with the requirements of Article 12.

**905.2.2.**—When a sprinkler system is installed in accordance with section 1213 in types 2A, and 2B construction, the area may be unlimited.

**905.3. Petroleum Bulk Storage Buildings.**—Warehouses for the bulk storage of not more than fifty thousand (50,000) gallons of lubricating oils with a flash point of not less than three hundred (300) degrees F. in approved sealed containers may be erected outside the first and second fire zones of masonry wall (type 3) construction not more than five thousand (5,000) square feet in area and not more than one (1) story or twenty (20) feet in height; or to proportionate areas in other types

of construction as regulated by section 221.2 table 2-2. Not more than one (1) motor vehicle may be stored in such buildings unless separately enclosed with a Type A fire division of two (2) hours fireresistance.

**905.4. Packing and Shipping Rooms.**— Every packing or shipping room located on or below a floor occupied for mercantile uses shall be separated therefrom by fire divisions of not less than the fireresistance of the type of construction of the building but in no case less than three-quarter (3/4) hours fireresistance.

**905.5. Truck Loading and Shipping Areas.**— Truck loading and shipping areas shall be permitted within any business building provided such areas are enclosed in construction of not less than the fireresistance of the type of construction of the building but in no case less than three-quarter (3/4) hours; and direct access is provided therefrom to the street.

**905.6. Residential Buildings.**

**905.6.1. Protected Ordinary Construction.**— Multi-family dwellings (occupancy group L-2) of protected ordinary (type 3-B) construction may be increased to six (6) stories or seventy-five (75) feet in height when the first floor above the basement or cellar is constructed of not less than three (3) hour fire-resistive construction, the floor area is subdivided by two (2) hour fire walls into fire areas of not more than three thousand (3,000) square feet, and the stairways, public hallways and exitways are enclosed in two (2) hour fire-resistive construction.

**905.6.2. Protected Noncombustible Construction.**— When of three-quarter (3/4) hour protected noncombustible (type 2-B) construction, multi-family dwellings (use group L-2) may be increased to nine (9) stories or one hundred (100) feet in height when separated not less than fifty (50) feet from any other building on the lot and from interior lot lines, the exitways are segregated in a fire area enclosed in a continuous fire wall of two (2) hour fireresistance and the first floor is not less than one and one half (1-1/2) hours fire-resistive construction.

**905.6.3. Retail Business Use.**— Subject to the restrictions of the zoning laws, the first floor of buildings of unprotected non-combustible (type 2-C), masonry wall (type 3-C) or frame (type 4-B) construction may be occupied for retail store use, provided the ceilings and enclosure walls are protected to afford three-quarter (3/4) hour fireresistance and the exitways from the residence floors are separately enclosed in accordance with the requirements of section 909.5 and article 6.

**905.7. Grade Floor Protection.**

**905.7.1. Non-Fireproof Construction.**—In all buildings other than one- and two-family dwellings (occupancy group L-3) and other than fireproof (types 1A and 1B) construction with habitable or occupiable stories or basements below grade, the ceilings, partitions and supports below the grade floor shall be protected with noncombustible materials or assemblies of component materials having a fireresistance rating of not less than three-quarter (3/4) hours or shall be of heavy mill (type 3A) construction, or shall be equipped with automatic sprinklers; but in no case less than the required fireresistance of the occupancy group and type of construction required by section 221.1 table 2-1 and section 221.2 table 2-2.

**905.7.2. Protected Noncombustible Construction.**—In all buildings of one and one-half (1-1/2) hour protected noncombustible (type 2-A) construction, more than four (4) stories or fifty (50) feet in height, in other than residential occupancy groups, the floor above the basement or cellar shall be constructed with a fireresistance of not less than two (2) hours.

**905.7.3 One- and Two-Family Dwellings.**—One- and two-family dwellings (occupancy group L-3), not more than (2) stories and attic or thirty-five (35) feet in height, shall be exempt from the requirements of section 905.7.

**905.7.4. Below Grade Assembly Uses.**—No dance hall, skating rink or similar places of public assembly for amusement, entertainment, instruction, or service of food or refreshment shall be located in rooms or spaces, the floor levels of which are more than three (3) feet below grade unless the floor construction above and below is of not less than one and one-half (1-1/2) hours fireresistance.

**SECTION 906.0. ENCLOSURE WALLS**

All exterior masonry and other enclosure walls shall comply with the structural provisions of articles 7 and 8 and with the fireresistance requirements of section 221.1 table 2-1 as regulated by the location and type of construction. Where other provisions of this code require a space or facility to be enclosed, the construction requirements for the enclosure shall not apply to any exterior wall that forms part of the enclosure.

**906.1. Exceptions.**—The provisions of this code shall not be deemed to prohibit the omission of enclosure walls for all or

part of a story when required for special uses and occupancies; except that when so omitted, the open areas shall be separated from the rest of the area and from the upper and lower stories of the building by wall and floor construction of the fireresistance required in section 221.1 table 2-1; and except as otherwise specifically permitted in this code, and the piers, columns and other structural supports within the open portion shall be constructed with the fireresistance required for exterior bearing walls in section 221.1 table 2-1.

**906.2. Stone Masonry Piers.**—In buildings of fireproof (types 1A and 1B) construction, stone masonry shall not be used for interior isolated piers, columns, arches or vaultings, that support loads in addition to their dead weight except in church and similar monumental buildings; but this shall not prohibit the use of stone facings on loadbearing piers installed in accordance with the provisions of sections 863 and 873.

**906.3. Fire Canopies.**—All fire canopies required by section 918.5.1 shall be constructed of noncombustible materials extending out at least two (2) feet horizontally from the wall and at least as long as the width of the lower opening and constructed to provide a fireresistance rating required for the exterior wall.

**906.4. Parapets.**—Parapets shall be provided on all exterior walls of buildings of construction types 3A, 3B or 3C that have roof construction of combustible materials, shall be at least two (2) feet high, shall be of materials and assembly having at least the fireresistance rating of the wall below and shall otherwise conform to the requirements of section 870.0. Exceptions where parapets need not be provided on the exterior walls shall be made for the following buildings:

**906.4.1.** One (1) story buildings less than twenty-two (22) feet high; or

**906.4.2.** A building whose roof has a pitch of more than twenty (20) degrees to the horizontal and whose overhang, fascia, cornice or gutter is of noncombustible construction, or if of combustible construction, is separated from the roof and ceiling construction by construction having the fireresistance rating required for the exterior wall of the building. Combustible members, including roof sheathing, shall not extend through this construction, but shall have at least four (4) inches of solid noncombustible material below, at the sides, and at the ends of such members; or

**906.4.3.** A building is provided with a fire canopy, or not more than two (2) feet below the roof level, continuous around that portion of the wall that is without a parapet, constructed as required by section 906.3; or

**906.4.4.** A building whose roof has a class A roof covering, and any overhangs, cornices, or gutters are constructed as required by section 906.4.2 above.

## **SECTION 907.0. FIRE WALLS AND PARTY WALLS**

Fire walls, party walls and other Type A Fire Divisions shall be constructed of noncombustible materials or assembly of noncombustible materials or form of construction of the required strength and fireresistance rating specified in section 221.1 table 2-1 for the type of construction but not less than the fire-resistance rating required in section 902.4 table 9-2 for the occupancies involved. The construction shall comply with all the structural provisions for bearing and nonbearing walls of this code.

**907.1. Solid Brick.**—In other than frame buildings, when constructed of solid brick masonry, the wall thickness shall conform to the requirements of section 868; except that in all buildings more than twenty-five (25) feet in height used for moderate fire hazard storage (occupancy group B-1) and all high hazard uses (occupancy group A), no part of an unplastered masonry fire wall shall be less than twelve (12) inches thick.

**907.2. Reinforced Concrete.**—When constructed of reinforced concrete, the wall thickness shall be not less than six (6) inches for the uppermost twenty-five (25) feet or portion thereof and shall increase two (2) inches for each additional twenty-five (25) feet or portion thereof measured down from the top of the wall; except that in buildings more than twenty-five (25) feet in height used for storage of moderate fire hazard (occupancy group B-1) and high hazard (occupancy group A), no part of an unplastered reinforced concrete fire wall shall be less than eight (8) inches thick.

**907.3. Frame Dwellings.**—In one- and two-family dwellings (occupancy group L-3), of frame (type 4) construction, party walls shall be not less than three-quarter ( $3/4$ ) hour fireresistive construction and shall extend through intersecting walls of frame construction to the outside of all combustible wall and roof sheathing.

**907.4. Other Frame Buildings.**—In frame buildings, in occupancy groups other than one- and two-family dwellings, all fire walls, party walls and type A fire divisions shall not be less than two (2) hour fireresistive construction, but in no case less than rating required in section 902.4 table 9-2. These divisions shall project at least twelve (12) inches through the exterior wall which projection may be eliminated where the exterior walls are constructed of noncombustible materials for a distance of at least eighteen (18) inches on each side of the fire division and their junction is smoke tight.

**907.5. Cutting Fire Walls.**—Chases or recesses shall not be cut into fire divisions so as to reduce their thickness below that required for all fireresistance rating, except that no chases, recesses or pockets for insertion of structural members subsequent to erection shall be cut in walls of eight (8) inches or less in thickness.

**907.5.1.** Where combustible members such as joists, beams, or girders bear on, or frame into, vertical fire divisions, such members shall not extend through the wall and shall have at least four (4) inches of solid noncombustible material below, at the sides, and at the ends of each such member.

**907.6. Hollow Fire Walls and Type A Fire Divisions.**—Vertical fire divisions and walls that are hollow shall be firestopped with at least four (4) inches of noncombustible material so as to prevent passage of flame, smoke, or hot gases through the hollow spaces to the story above or below, or to hollow spaces within connecting floor or roof construction.

**907.7. Combustible Insulation.**—The building official may permit the application of cork or fiber board or other combustible insulation if laid up without intervening air spaces and cemented or attached directly to the face of the fire wall and protected on the exposed surface as provided in section 824.

**907.8. Continuity of Fire Walls and Type A Fire Divisions.**—Fire walls and other vertical type A fire divisions shall be continuous between foundation, roof, or horizontal type A fire divisions and through any concealed space in floor or roof construction. Horizontal type A fire divisions shall be continuous between exterior walls and/or vertical type A fire divisions.

**907.8.1.** When roof construction is combustible on both sides of a type A vertical fire division, the division shall extend through the roof construction to a height of at least four (4) inches above the high point at the roof framing. Decking shall tightly

butt the fire division. Above the decking of roofs that are flatter than twenty (20) degrees to the horizontal blocking shall be constructed to form cants on both sides of the fire division with slopes not steeper than 1:4. Combustible decking shall not extend over the top of the fire division.

**907.8.2.** Except as required in 907.8.3 below, when roof construction is noncombustible on one (1) or both sides of a vertical fire division, the vertical fire division may terminate at the underside of the noncombustible roof construction provided the junction of the wall and roof construction is made smoke tight.

**907.8.3.** When a vertical type A fire division is required by section 902.4 table 9-2 to have a fireresistance rating of three (3) or four (4) hours, and the roof construction has a fireresistance rating of less than two (2) hours, the fire division shall extend above the roof construction to form a parapet at least three (3) feet high.

**907.8.4.** Fire walls and Type A fire divisions shall be so constructed that the removal or collapse of construction on one side will not endanger the support of construction on the other side.

**907.8.5.** Fire walls and fire divisions shall be made smoke tight at their junction with exterior walls.

**907.9. Offset Fire Walls and Divisions.**—Fire walls and other type A fire divisions may be offset if the construction between the offset divisions, including their supports, has at the same fireresistance rating as the fire division, with all hollow spaces within the construction firestopped with noncombustible material.

## **SECTION 908.0. FIRE WALL OR VERTICLE TYPE A FIRE DIVISION OPENINGS**

Openings in said walls and fire divisions shall not exceed the limits in size and area herein prescribed and the opening protectives shall conform to the provisions of sections 903, 904 and 917.

**908.1. Size of Openings.**—In buildings without sprinkler system no opening through a fire wall or verticle type A fire division shall exceed one hundred and twenty (120) square feet in area, with no dimension greater than twelve (12) feet, and the aggregate width of all openings at any level shall not exceed twenty-five (25) per cent of the length of the wall. Where the areas on both sides of a fire division are sprinklered in accordance with article 12, the size of the opening may be one hundred and fifty (150) sq. ft. in area, with no dimension greater than fifteen (15)

feet. In buildings fully sprinklered in compliance with the provisions of article 12, the size and aggregate width of openings through fire divisions and walls shall be unlimited.

**908.2. First Story Exceptions.**—In buildings of all types of construction, when the entire areas on both sides of a fire wall are protected with an approved automatic sprinkler system complying with article 12, openings designed for the passage of trucks may be constructed not more than two hundred and forty (240) square feet in area with a minimum distance of three (3) feet between adjoining openings. Such openings shall be protected with approved automatic opening protectives of three (3) hour fire resistance and provided with an approved water curtain for such openings in addition to all other requirements.

**908.3. Opening Protectives.**—Except as section 917.1 may require, every opening in a fire wall or vertical type A fire division shall be protected by opening protectives having the fireresistance rating prescribed in section 908.31 table 9-3.

**908.3.1. Table 9-3 Opening Protectives for Fire Walls and Fire Divisions.**

<b>Fire-Resistance Rating of Fire Wall or Division in which opening occurs</b>	<b>Fire Protection Rating of Opening Protection*</b>
3 or 4 hours	3 hours (Class A)
2 or 1-1/2 hours	1-1/2 hours (Class B)
1 hour	3/4 hour (Class C)

\*When not a part of a means of egress, the opening protective shall be applied on each face of the opening, with each protective individually having the required rating except that only a single protective shall be required when it is installed wholly within the thickness of the wall.

**908.4. Horizontal Exitway.**—Door openings in a fire wall serving as a horizontal means of egress shall be protected with an approved one and one-half (1-1/2) hour self-closing swinging fire door or its labeled equivalent when designed as an exitway from one side. When serving as a dual exitway, there shall be adjacent openings with swinging fire doors opening in opposite directions. Signs shall be provided indicating as an exit, the door which swings in the direction of travel from that side. The size of openings shall comply with section 616. An automatic fire door, fire curtain, or water curtain shall be provided on the opposite side of each such opening.



**SECTION 909.0. FIRE PARTITIONS**

**909.1. Construction.**—Fire partitions required for the enclosure of exitways and areas of refuge shall be constructed of approved masonry, reinforced concrete or other approved noncombustible materials having the minimum fireresistance prescribed by section 221.1 table 2-1, except that partitions constructed of combustible materials to provide the required fireresistance may be accepted for use in exitways of buildings of types 3 and 4 construction as regulated by section 221.1 table 2-1 and the provisions of section 618.9.

**909.2. Bearing Partitions.**—When fire partitions are used as bearing walls, they shall comply with all the structural provisions of article 8 governing height and thickness.

**909.3. Continuity.**—When fire partitions around vertical shafts are not continuous from floor to floor, the offset in the floor construction shall be of construction with a fireresistance rating not less than that of the partition construction, nor less than that of the fireresistance rating required in section 902.4 table 9-2 for the specific occupancy involved.

**909.4. Openings.**

**909.4.1. Size.**—No other openings shall be permitted in fire partitions except exitways doors, and the aggregate permissible width of such doorways shall not exceed twenty-five (25) per cent of the length of the wall, nor shall the maximum area of any individual opening exceed forty-eight (48) square feet.

**909.4.2. Protectives.**—All opening protectives in fire partitions in other than one- and two-family dwellings shall comply with the provisions of sections 903 and 918 for construction, except as provided in section 618.93 for buildings not more than three (3) stories in height.

**909.5. Combustible Stair Enclosures.**

**909.5.1. Construction.**—Stair enclosures constructed of approved combustible assemblies protected with component materials to afford the required fireresistance ratings shall be continuous through combustible floor construction and shall provide an unbroken fire barrier in combination with protected floors, ceilings and fire doors, separating the exitways from the unprotected areas of the building. Such enclosures shall be fire-stopped to comply with sections 877.9 and 921.

**909.5.2. Openings for Lighting.**—Openings for the purpose of providing light in such enclosures may be protected with wired glass with single panes not more than three hundred and sixty

(360) square inches in area and a total area in one story of not more than seven hundred and twenty (720) square inches. Such light panels shall comply with the provisions of section 919 and shall be contained in stationary sash and frames of steel or other approved noncombustible materials.

## **SECTION 910.0. FIRERESISTIVE PARTITIONS AND TYPE B FIRE DIVISIONS**

**910.1. Construction.**—Type B fire divisions shall be constructed of materials or assembly of materials having at least the fireresistance ratings required by section 902.4 table 9-1, except that when used to separate different tenant apartments, suites, stores, offices or other spaces from each other the fireresistance rating prescribed shall be that indicated in section 902.4 table 9-1 but in no case less than one (1) hour and shall continue through any concealed spaces of the floor or roof construction above.

**910.2. Supports**—All fireresistive partitions shall extend from the top of the fireresistive floor below to the fireresistive ceiling above, and shall be securely attached thereto. They shall be supported on fireproofed steel or reinforced concrete construction; except that the supporting beams and girders of fireresistive partitions constructed of combustible materials shall be protected with component materials or assemblies to afford the required fireresistance of the partitions supported. All hollow vertical spaces shall be firestopped at every floor level as required in sections 877 and 921.

**910.3. Openings.**—Door openings shall not exceed one hundred and twenty (120) square feet in area and where required to be fire protected, they shall comply with the provisions of sections 904 and 917.

### **910.4. Exceptions.**

**910.4.1. Non-Fireproof Construction.**—In buildings and structures of masonry enclosed (type 3) and frame (type 4) construction, protected wood studs or other combustible assemblies constructed with component materials to afford the required fire-resistance specified in section 221.1 table 2-1 shall be approved for enclosures of exitways where permitted in section 618.93 and for all nonbearing partitions.

**910.4.2. Fireproof Construction.**—In buildings and structures of fireproof (type 1) or of protected noncombustible (type 2) construction:

- a. Of other than group H, L-1 and L-2 occupancies, partitions of a single thickness of wood or approved composite panels, and glass or other approved materials of similar combustible characteristics, may be used to subdivide rooms or spaces into offices, entries, or other similar compartments, provided they do not establish a public corridor or a private corridor serving an occupant load of fifty (50) or more in areas occupied by a single tenant and not exceeding five thousand (5,000) square feet between fireresistive partitions and fireresistive floors, or type A fire divisions.
  1. Larger areas may be subdivided with fireretardant wood or with materials of similar combustible characteristics when complying with section 903.72, but not to exceed fifty (50) per cent increase in area.
- b. Nonbearing partitions that are not required to have a fireresistance rating may be constructed of fireretardant treated wood and furring as provided in section 903.8, and except that such partitions and furring may be constructed of combustible materials in spaces classified in class E, L-2 or L-3 occupancies provided the space containing the combustible portions does not exceed five thousand (5,000) square feet in area within a non-combustible enclosure having a fireresistance rating of at least one (1) hour, is of a single tenancy and glass or approved light transmitting plastic is used for glazing.

## **SECTION 911.0. VERTICAL SHAFTS AND HOISTWAYS**

The provisions of this section for the enclosure shafts shall apply to all shafts except that floor openings accommodating a slide pole in a fire house shall be exempt from these provisions and except as provided for stairway enclosures in section 618, flue enclosures in section 1008, incinerator chutes in sections 1016 and 1017, duct shafts in sections 1018 and 1019, pipe shafts in section 1117 and elevator and dumbwaiter hoistways in article 16.

**911.1. Wall Enclosure.**—The shafts shall be enclosed with materials having at least the fireresistance rating required by section 221.1 table 2-1 and as supplemented herein.

**911.1.1. Open Shafts.**—The enclosing wall of shafts that are open to the outer air at the top shall be constructed of materials specified in article 8 for exterior walls of buildings and structures.

**911.1.2. Closed Shafts.**—The enclosing walls of interior covered shafts shall be constructed of approved masonry, reinforced concrete or other approved construction with a fireresistance rating of not less than two (2) hours, except as provided in section 911.

**911.1.3. Shafts in Residential Buildings.**—In one- and two-family dwellings of other than fireproof or noncombustible construction, shafts may be supported on and constructed of combustible materials or assemblies having a fireresistance rating of not less than three-quarter ( $3/4$ ) hours, and shall extend not less than three (3) feet above the roof with a ventilating skylight of noncombustible construction as specified in section 927.2.

## **911.2. Top Enclosure.**

**911.2.1. Not Extending to Roof.**—A shaft that does not extend into the top story of the building shall be enclosed with top construction of the same strength and fireresistance as the floors of the building or structure in which it occurs, but in no case less than that of the fireresistance rating of the shaft enclosure.

**911.2.2. Extending to Roof.**—A shaft that extends through or serves the top most story of a building shall extend through the roof at least thirty-six (36) inches above any combustible roof construction. Where the roof construction is of noncombustible materials, the shaft shall extend through any concealed space within the roof construction and may terminate at the underside of the roof deck. Pipes and ducts penetrating shaft construction shall comply with the requirements of this code.

**911.3. Bottom Enclosure.**—All shafts that do not extend to the bottom of the building or structure shall be enclosed at the lowest level with construction of the same strength and fire-resistance as the lowest floor through which it passes, but in no case with a fireresistance rating less than that of the shaft enclosure.

**911.4. Shaft Openings.**—No openings other than necessary for the purpose of the shaftway shall be constructed in shaft enclosures; and except in shafts that contain only one opening below the roof terminus, all openings shall be protected with approved fire doors, curtains, shutters or fixed metal sash with wired glass complying with the provisions of sections 917, 918 and 919.

**911.4.1.** Where a window is located in a shaft wall that is an exterior wall and is ten (10) stories or less above grade or three (3) stories or less above a roof, it shall be protected against entrance by a permanently secured grille consisting of five-eighths ( $5/8$ ) inch diameter bars ten (10) inches o.c. vertically, or by a stationary metal sash window having one-eighth ( $1/8$ ) inch thick solid section steel muntins, eight (8) inches o.c. one way.

**911.5. Venting of Closed Shafts.**—All closed shafts having an area exceeding four (4) square feet shall be provided with a smoke vent having an area of at least three and one half ( $3-1/2$ ) per cent of the maximum shaft area at any floor, but in no event less than one half ( $1/2$ ) square foot. Smoke vents may be windows, louvers, skylights, vent ducts, or similar devices. Vent ducts shall be enclosed by construction having the same fire-resistance rating as required for the shaft enclosure. Such vent ducts shall extend vertically, diagonally, or horizontally as follows:

**911.5.1.** Through any roof of the building provided the vent opening is at least ten (10) feet from any window, door, outside stairway, or interior lot line. This dimension may be reduced to five (5) feet if the vent duct is extended up to at least the level of the top of the window or door. A vent that is required to extend above a roof shall extend at least eight (8) inches above a roof assembly constructed of noncombustible materials, and at least thirty-six (36) inches above a roof assembly constructed of combustible materials that are within a horizontal distance of ten (10) feet.

**911.5.2.** Through an exterior wall of the building, provided there are no openings in the wall within a distance of thirty (30) feet vertically above the vent opening, and within five (5) feet either side of the vent opening. When a side of a shaft is an exterior wall or a wall of a roof bulkhead, the required vent may be a louver or window. Any window or louver located in a shaft wall above a roof constructed of combustible materials shall have its sill at least thirty-six (36) inches above the roof.

**911.5.3.** Of the total required vent area for shafts, at least one-third ( $1/3$ ) shall be clear opening to the outdoors, either in the form of fixed louvers, ridge vents, or hooded or goosenecked openings. In lieu thereof, skylights or trap doors may be used if constructed and arranged to open automatically by fusible link or other mechanical device when subjected to a temperature of one hundred and sixty (160) degrees F. or to a rapid rise in

temperature at a rate of fifteen (15) to twenty (20) degrees F. per minute. The remaining portion of the required vent area may be a window or skylight glazed with plain glass not more than one eighth ( $1/8$ ) inch thick or slow burning plastic.

**911.6. Equipment Rooms.**—Any room, space, or compartment containing equipment or machinery that communicates with a shaft enclosure shall comply with all requirements for shafts. The required louver or glazing shall not be located in any door leading into such room, space or compartment.

**911.7. Existing Shaftways.**—In all existing shaftways of buildings of assembly (occupancy groups F1, F2, F3 and F4), institutional (occupancy groups H1 and H2) and residential (occupancy groups L1 and L2) classifications, which are not already enclosed as herein required, the building official shall direct such construction as he may deem necessary to insure the safety of the occupants.

## **SECTION 912.0. WALL LINTELS**

**912.1. Fire Protection.**—Lintels over openings wider than four (4) feet in masonry walls, other than in walls of masonry veneer on wood frame structures, shall be fire protected as required by section 913 for structural members, when the full load over the opening is not relieved by a masonry arch of required strength. The members of an assembled metal lintel that support only outer face masonry that is securely bonded or anchored to backing, need not be fire protected, provided that the inner members of the assembly support the full load imposed upon the lintel and are fire protected as required for structural members supporting masonry.

**912.2. Stone Lintels.**—The use of stone lintels on spans exceeding four (4) feet shall not be permitted unless supplemented by fire protected structural members or masonry arches of the required strength to support the superimposed loads.

## **SECTION 913.0. BEAMS AND GIRDERS**

All beams and girders shall be protected with noncombustible materials or assemblies of component materials to afford the fireresistance specified in section 221.1 table 2-1 and as herein modified.

**913.1. Protection of Beams and Girders.**—Beams and girders that are required to be fire protected, and that support only

one (1) floor or a roof, and/or a nonbearing wall not more than one (1) story high, shall be individually encased on all sides with materials having the required fireresistance rating; or shall be protected by a ceiling as specified in section 913.2 having the required fireresistance rating; or shall be protected by a combination of both a ceiling and individual encasement which, together, provide the required fireresistance rating. Beams and girders that are required to be fire protected, and that support more than one (1) floor or a nonbearing wall more than one (1) story high, or a bearing wall, shall be individually encased on all sides for their entire length or height with materials having the required fireresistance rating. Similar individual encasement shall be provided for all structural elements supporting stairway enclosures.

**913.1.1.** Ceilings that contribute to the required fireresistance rating of a floor or roof assembly shall be continuous between exterior walls, vertical fire divisions, or vertical partitions having at least the same fireresistance rating as the ceiling.

**913.2. Ceiling Fixtures.**—Ceilings required to have a fireresistance rating may be pierced to accommodate noncombustible electric outlet boxes or recessed lighting fixtures, if the aggregate area of such openings does not exceed sixteen (16) square inches in each ninety (90) square feet of ceiling area and the electrical outlet boxes or recessed lighting fixtures are constructed of steel at least .022 inches thick and sealed tightly at the ceiling. Noncombustible pipes, ducts, and additional or larger electrical or other service facilities may pierce ceilings that are required to have a fireresistance rating only when the type of ceiling to be used has been tested with such types of facilities installed in place and the proportionate area of openings for such facilities to be installed in the ceiling does not exceed the proportionate area of such openings in the assembly tested, and provided no opening is larger than that in the assembly tested. Protection for such openings shall be the same as provided in the test. Duct openings installed in accordance with the foregoing shall be protected by fire dampers complying with the requirements of article 18.

**913.3. Firestopping of Ceiling Spaces.**—Floor or roof assemblies required to have a fireresistance rating shall have any concealed spaces therein firestopped as outlined below.

**913.3.1. Firestopping of Non-Combustible Construction.**—The concealed space above fireresistive ceilings shall be firestopped

into areas not exceeding three thousand (3,000) square feet with materials listed in section 921.0 for the full height of the concealed space. Access to each such concealed space may be through one (1) or more openings not exceeding nine (9) square feet and protected by self-enclosing opening protectives having the fire protection rating required by section 221.1 table 2-1. Fire-stopping shall not be required where the structural members within the concealed space are individually protected with materials having the required fireresistance rating, or where the ceiling is not an essential part of the fireresistance assembly. Fire-stopping shall not be required where a concealed space is sprinklered in accordance with the construction requirements of article 12. Concealed spaces over boiler rooms and under roofs may be ventilated to the outer air.

**913.4. Firestopping of Wood Joist Construction.**—Where the ceilings are suspended below wood joist floor construction, the space between the ceiling and the floor above shall be fire-stopped in areas of not more than one thousand (1,000) square feet with materials meeting the requirements of section 921.0.

**913.5. Wall Supports.**—Structural members which support walls shall be protected in conformance with section 913.1 to afford not less than the required fireresistance of the wall construction supported thereon.

**913.6. Exterior Exposed Beams and Girders.**—Beams and girders exposed to the outdoors on buildings that do not exceed two (2) stories or thirty (30) feet in height, which are required by section 221.1 table 2-1 to have a fireresistance rating not exceeding one (1) hour need not be protected on any face of the member that has an exterior separation of thirty (30) feet or more, provided the outdoor area within the thirty (30) foot separation distance is not used for storage of materials, or for motor vehicle parking.

**913.7. Beams and Girders in Cavity Walls.**—Where beams and girders occur within exterior cavity walls, portions of such structural members facing the exterior need not be individually fire protected if the outer wythe of the cavity wall provides the required fireresistance rating and is located not more than two and one-half (2-1/2) inches from such structural members, and if all surfaces of the structural members are fire protected from the interior of the building by materials having the required fireresistance rating.



**913.8. Elevators.**—Beams and girders located wholly within the shaft and not an integral part of the support of the shaft need not be fire protected.

**913.9. Embedments and Enclosures.**—Pipes, wires, conduits, ducts, or other service facilities shall not be embedded in the required fire protection of a structural member that is required to be individually encased; except that pipes, wires, and conduits may be installed in the space between the required fire protection and the structural member protected, provided that where such facilities pierce the required fire protection, the area of the penetrations does not exceed two (2) per cent of the area of the fire protection, on any one (1) face, the penetrations are closed off with close-fitting metal escutheons or plates and the concealed space shall be fire-stopped at each story in accordance with the provisions of section 913.3.

**913.10. Impact Protection.**—Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise, or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection. Where applicable, such protection shall be designed in accordance with the requirements of section 710.

## **SECTION 914.0. COLUMNS**

All steel, iron and other approved metal columns and reinforcement in concrete columns shall be protected with noncombustible materials or assemblies of component materials to afford the fireresistance specified in section 221.1 table 2-1 and as herein modified. Columns that are required to be fire protected, and that support only one floor or a roof, and/or a non-bearing wall not more than one (1) story high, shall be individually encased on all sides with materials having the required fireresistance rating; or shall be protected by a ceiling as specified in section 913.2 having the required fireresistance rating; or shall be protected by a combination of both a ceiling and individual encasement which, together, provide the required fireresistance rating. Columns that are required to be fire protected, and that support more than one (1) floor or support a bearing wall or non-bearing wall more than one (1) story high, shall be individually encased on all sides for their entire length or height

with materials having the required fireresistance rating; (or shall be protected by a combination of both a ceiling and individual encasement which, together, provide the required fireresistance rating.)

**914.1. Exterior Columns.**—Columns located in exterior walls or along the outer lines of a building or structure shall be fire-protected as required by this section and shall be protected against corrosion by cement parging, waterproofing, or other approved methods complying with section 874.

**914.2. Columns in Cavity Walls.**—Where columns occur within exterior cavity walls, portions of such structural members facing the exterior need not be individually fire protected if the outer wythe of the cavity wall provides the required fireresistance rating and is located not more than two and one half (2-1/2) inches from such structural members, and if all surfaces of the structural members are fire protected from the interior of the building by materials having the required fireresistance rating.

**914.3. Embedments and Enclosures.**—Pipes, wires, conduits, ducts, or other service facilities shall not be embedded in the required fire protection of a structural member that is required to be individually encased; except that pipes, wires, and conduits may be installed in the space between the required fire protection and the structural member protected, provided that where such facilities pierce the required fire protection, the area of the penetrations does not exceed two (2) per cent of the area of the fire protection on any one face, the penetrations are closed off with close-fitting metal escutcheons or plates and the concealed space shall be firestopped at each story in accordance with the provisions of section 913.3.

**914.4. Mechanical Protection.**—Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise, or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material, to a height adequate to provide full protection. Where applicable, such protection shall be designed in accordance with the requirements of section 710.

**914.5. Exterior Exposed Columns.**—Columns exposed to the outdoors on buildings that do not exceed two (2) stories or thirty (30) feet in height, which are required by section 221.1 table 2-1 to have a fireresistance rating not exceeding one (1) hour need not be protected on any face of the member that has an

exterior separation of thirty (30) feet or more, provided the outdoor area within the thirty (30) foot separation distance is not used for storage of materials, or for motor vehicle parking. The interior faces of exterior columns shall be protected and insulated as otherwise required.

#### **914.6. Anchors, Bands and Ties.**

**914.6.1. Concrete Reinforcement.**—Concrete fire protection on structural metal columns shall be reinforced and anchored by wire mesh, metal caging, metal clips or spirally wound wire of approved types. Wire fabric shall be not less than No. 12 U.S. gage, four (4) by four (4) inch mesh or its equivalent; spirally wound wire shall be not less than No. 10 U.S. gage with not over four (4) inch pitch or equivalent heavier wire at a maximum pitch of eight (8) inches.

**914.6.2. Gypsum Concrete Reinforcement.**—Poured-in-place gypsum fire protection shall be reinforced and anchored by wire fabric of not less than No. 16 U.S. gage, two (2) by two (2) inch mesh or No. 14 U.S. gage, four (4) by four (4) inch mesh.

**914.6.3. Masonry Unit Ties.**—Block and tile fireproofing units shall be securely anchored or bounded by wall ties, metal mesh or metal u-clips in the horizontal joints, or by outside tie wires not less than No. 16 U.S. gage with at least one (1) tie around every block course; or shall consist of special masonry units designed to furnish positive anchorage to the structural member and to each other.

**914.6.4. Exposed Ties.**—When outside tie wires are used, they shall be protected by not less than one-half (1/2) inch of cement mortar, or gypsum plaster or the equivalent fireresistive covering.

**914.7. Reinforced Concrete Columns.**—The thickness of protection required outside of reinforcing steel in the concrete columns shall be proportioned by test to meet the fireresistive requirements of section 221.1 table 2-1 based on the fireresistive classification of concrete aggregates.

### **SECTION 915.0. TRUSSES**

All trusses shall be protected with noncombustible materials or assemblies of component materials to afford the fireresistance specified in section 221.1 table 2-1 and as herein modified.

**915.1. Protection of Trusses.**—Trusses that are required to be fire protected, and that support only one floor or a roof, and/or

a non-bearing wall not more than one (1) story high, shall be individually encased on all sides with materials having the required fireresistance rating; or shall be protected by a ceiling as specified in section 913.2 having the required fireresistance rating; or shall be protected by a combination of both a ceiling and individual encasement which, together, provide the required fireresistance rating. Trusses that are required to be fire protected, and that support more than one floor or support a bearing wall or non-bearing wall more than one story high, shall be individually encased on all sides for their entire length or height with materials having the required fireresistance rating.

With the use of a continuous ceiling of the specified fireresistance rating, the enclosed truss space shall have an access doorway with maximum dimensions of three (3) by three (3) feet, equipped with an opening protective of the same fire-resistance rating as the required truss protection. When the trusses or the roof decking are permitted to be constructed of combustible materials, the space above the required fireresistive ceiling shall be subdivided into maximum areas of three thousand (3,000) square feet as required for attic spaces in section 219.

**915.2. One Story Buildings.**—In all one (1) story buildings required to be of fireresistive construction, no protection shall be required for the members of roof trusses, purlins or roof beams when the height to the lowest chord is twenty (20) feet or more from the floor.

**915.3. Roofs Less Than Twenty (20) Feet High.**—In multi-story buildings of types of construction in which fire protected coverings of the structural framework are required by section 221.1 table 2-1 and the provisions of this code, the fire protection of individual members of the roof truss may be omitted when the clear height of the lower chord of the truss is more than fifteen (15) and less than twenty (20) feet above the floor, gallery or balcony immediately below and a three-quarter (3/4) hour continuous ceiling is installed.

**915.4. Roofs Twenty (20) Feet or Higher.**—When every part of the structural framework is twenty (20) feet or more above the floor immediately below, all fire protection of the structural members may be omitted, including the protection of roof beams and purlins.

**915.5. Roof Slabs and Arches.**—Where the omission of fire protection from roof trusses and purlins is permitted, the horizontal or sloping roofs in fireproof (type 1) and noncombustible

(type 2) construction, immediately above such trusses, shall be constructed of noncombustible materials of the required strength without a specified fireresistance rating, or of mill type construction in buildings not over five (5) stories or sixty-five (65) feet in height.

## **SECTION 916.0. EXTERIOR OPENING PROTECTIVES**

Where specified herein, the exterior openings of all buildings and structures, more than three (3) stories or forty (40) feet in height, other than churches (occupancy group F4), residential buildings (occupancy groups L2 and L3) and buildings of frame (type 4) construction, shall have approved opening protectives meeting the requirements of section 903.6 and the provisions of article 4 for special uses and occupancies.

**916.1. Horizontal Exposure.**—Approved protectives shall be provided in every opening facing a street thirty (30) feet or less in width, or within thirty (30) feet horizontally in a direct line not in the same plane of any unprotected noncombustible (type 2-C), unprotected frame (type 4-B) structure, or within thirty (30) feet horizontally of any opening in another building of any type of construction.

**916.2. Vertical Exposure.**—Approved protectives shall be provided in every opening which is less than fifty (50) feet vertically above the roof of an adjoining structure within a horizontal distance of thirty (30) feet of the wall in which the opening is located, unless such roof construction affords a fireresistance of not less than one and one-half (1-1/2) hours.

**916.3. General Exposure.**

**916.3.1. Interior Lot Line Exposure.**—Opening protectives shall be provided in every permissible wall opening in buildings of high hazard (occupancy group A) within eleven (11) feet of an interior lot line; in buildings of moderate hazard (occupancy group B1) within six (6) feet of such lot lines; and in wall openings of frame buildings which are erected within six (6) feet of interior lot lines, except for store fronts and window and door openings in dwellings of occupancy groups L2 and L3.

**916.3.2. Exterior Opening.**—Exterior openings above the third floor level of a building or above a height of forty (40) feet, except buildings in occupancy group L3, open parking structures and buildings of construction types 4A and 4B, shall have opening protectives when:

- a. any part of the opening is less than thirty (30) feet distant in a direct unobstructed line not in the same plane, from an opening in another building or from a wood frame building, or
- b. any part of the opening is above and less than thirty (30) feet in a direct unobstructed line from any roof construction that has a fireresistance rating of less than one (1) hour or that has unprotected openings therein within this distance, whether the roof construction is on the same building or on an adjacent building.

**916.4. First Story Openings.**—The required fireresistive opening protectives may be omitted in show windows or other openings on the lowest story of a building facing on a street or public space not less than thirty (30) feet in width.

**916.5. Non-Automatic Protectives.**—Required opening protectives in exterior openings, if not self-closing or automatic, shall be kept closed by the occupants at all times when not required for light or ventilation under the provisions of article 5.

**916.6. Opening Protective Required Ratings.**—In a building or space classified in occupancy group A, all opening protectives shall be three-quarter (3/4) hour (Class E) opening protectives meeting the requirements of reference standard RS 9-7. Such protectives shall be fixed self-closing or automatic. Alternately, these openings may be protected with three-quarter (3/4) hour (Class F) protectives together with outside sprinklers installed in accordance with construction requirements of article 12. In such cases, there shall be an automatic dry pipe sprinkler head centered over each opening with the orifice directed against the opening. All opening protectives required by section 221.1 table 2-1 or by section 916.3.2 above in buildings classified in other than occupancy group A shall be three-quarter (3/4) hour (Class F) openings.

**916.6.1.** Exterior windows and doors, including their frames and glazing, that are not required by this code to have a fire-protection rating, may be of combustible materials. Glazing in balcony doors shall comply with the requirements of section 612.7.4.

## **SECTION 917.0. FIRE DOORS**

**917.1. Fire Door Assemblies.**—Approved fire door assemblies as defined in this Code shall be constructed of any material or

assembly of component materials which meet the test requirements of sections 903 and 904 and the fireresistance rating herein required.

Location	Fireresistance Rating in Hours
Fire walls and fire divisions of 3 or more hour construction	3
Fire walls and fire divisions of 2 hour construction	1-1/2
Shaft enclosures and elevator hoistways of 2 hour construction	1-1/2
Stairway and exitway enclosures of 1 hour or less except fire towers and grade passageways	3/4
Doors in exitways of residential and business use buildings not more than three (3) stories for forty (40) feet in height with an occupancy load of not more than forty (40) below or seventy (70) above grade and doors from hotel rooms (occupancy group L1), from hospital rooms (occupancy group H2), and from school rooms (occupancy group G) to corridors providing access to an exitway may be of noncombustible construction or of one and three-quarter (1-3/4) inch bonded solid-core wood doors.	

**917.2. Labeled Protective Assemblies.**—Labeled protective assemblies meeting the requirements of sections 903.6.3 and 903.6.5, and reference standards RS 9-5, RS 9-6 and RS 9-7, including shop inspection, shall be approved for use in the following typical and special situations:

**917.2.1. Typical Situations.**

**Class A Doors**—Fire wall openings in accordance with section 908.

**Class B Doors**—Verticle shafts and openings in fire partitions in accordance with sections 909 and 911.

**Class C Doors**—Openings in corridor, room and fireresistive partitions in accordance with section 910.

**Class D Doors and Windows**—Openings in exterior walls in exposing and exposed buildings of high hazard use (occupancy group A) in accordance with article 4 and along exterior stairways in accordance with section 621.

**Class E Doors and Windows**—Openings in exterior walls and along fire escapes except where class D protectives are required in accordance with section 624.

**917.2.2. Special Situations.**—Approved labeled opening protective assemblies shall be accepted as complying with the required time-temperature performance ratings specified in this code including the following special situations:

**Class A Doors**—High pressure boiler room walls in accordance with sections 618 and 1115.

Volatile flammables, film, pyroxylin products and fur storage vaults in accordance with sections 403, 408 and 409.

Grinding and grain processing rooms in accordance with section 411.

Paint and flammable storage rooms in accordance with section 412.

Dry cleaning rooms of high and moderate hazard in accordance with section 413.

Proscenium walls of theatres in accordance with section 418.

Transformer room walls in accordance with article 15.

**Class B Doors**—Motion picture studios in accordance with section 409.

Dressing rooms in accordance with section 418.

Show rooms in public garages in accordance with section 415.

Theatre exits and property rooms in accordance with section 418.

Fire and smokeproof towers in accordance with section 620.

Horizontal exits in accordance with sections 616 and 908.

**Class C Doors**—Projection and trial exhibition rooms in accordance with section 409.

Paint spray rooms in accordance with section 412.

Service stations and repair shops in accordance with sections 416 and 417.

Kitchen and service pantries in places of assembly in accordance with section 419.

Corridor rooms and all fireresistive partitions in accordance with section 910.

**Class D Doors**—Attached garages in accordance with sections 414 and 917.

Switchboard rooms where required by article 15.

**917.3. Deleted.**

**917.4. Glass Panels.**—Wired glass panels shall be permitted in fire doors within the limitations of section 919 and as herein specifically prescribed.

**917.5. Alternate Closing Devices.**—Except as may be otherwise provided for openings in fire enclosures and fire division walls,



all fire doors shall be self-closing. Fire doors shall be kept closed at all times, except that approved fail-safe electromagnetic holders activated by approved rate of temperature rise and smoke detection devices (installed in compliance with their listing) located on both sides of opening and capable of connection to a local or central fire alarm may be used on exit doors and smoke screen doors in horizontal hallways, exitways and corridors. Holders shall not be used on fire doors connecting to stairways or other vertical openings.

## **SECTION 918.0. FIRE WINDOWS AND SHUTTERS**

**918.1. Fireresistance Rating.**—Approved assemblies of fire windows and fire shutters shall meet the test requirements of sections 903 and 904, or shall be approved labeled assemblies meeting the requirements of section 903.6.5.

Steel window frame assemblies of one-eighth ( $1/8$ ) inch minimum solid section or of not less than No. 18 U.S. gage formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision for glazing with one-quarter ( $1/4$ ) inch wired glass as required in section 919.0, when securely installed in the building construction and glazed with one-quarter ( $1/4$ ) inch wired glass, shall be deemed to meet the requirements for a three-quarter ( $3/4$ ) hour fire window assembly.

**918.2. Window Mullions.**—All metal mullions which exceed a nominal height of twelve (12) feet shall be protected with insulating materials to afford the same fireresistance as required for the wall construction in which the protective is located.

**918.3. Swinging Fire Shutters.**—When fire shutters of the swinging type are used in exterior openings, not less than one (1) row in every three (3) vertical rows shall be arranged to be readily opened from the outside and shall be identified by distinguishing marks or letters not less than six (6) inches high.

**918.4. Rolling Fire Shutters.**—When fire shutters of the rolling type are used, they shall be approved counter-balanced construction that can be readily opened from the outside.

**918.5. Vertical Separation of Windows.**

**918.5.1. Where Required.**—In all buildings and structures exceeding three (3) stories or forty (40) feet in height, openings located vertically above one another in exterior walls which are required to have a fireresistance rating of more than three-quarter

(3/4) hours shall be separated by apron or spandrel walls not less than three (3) feet in height extending between the top of any opening and the bottom of the opening next above, or the floor above shall be protected by fire canopies conforming to provisions of section 906.3, set backs or other means of preventing vertical spread of fire. No vertical separation is required between exterior openings when the building is of unprotected construction (types 2C, 3C, and 4B), or when the lower of any two (2) successive exterior openings under consideration opens onto a room or space used for assembly, business, educational or residential occupancy.

**918.5.2. Fireresistance Rating.**—The apron or spandrel walls shall be constructed with the same fireresistance required for the exterior wall in which located as specified in section 221.1 table 2-1; except that when such required rating exceeds three-quarter (3/4) hours, approved wired glass construction in fixed noncombustible sash and frames not exceeding one-third (1/3) of the area of such apron or spandrel may be located therein, and except further that in exterior non-bearing enclosure walls which are not required to be of more than three-quarter (3/4) hour fireresistance, the provisions of this section in respect to apron or spandrel walls shall not apply.

## **SECTION 919.0. WIRED GLASS**

Wired glass in approved opening protective assemblies shall be not less than one-quarter (1/4) inch thick and shall be limited in area and location as herein required.

**919.1. Fire Wall Protectives.**—Wire glass in fire doors located in fire walls shall be prohibited, except that when serving as a functioning element in a required means of egress, the self-closing swinging door may be provided with a vision panel of not more than one hundred (100) square inches with no dimension exceeding twelve (12) inches.

**919.2. Fire Partition Protectives.**—Wired glass vision panels may be used in fire doors of one and one-half (1-1/2) hour fireresistance rating intended for use in fire partitions; but in no case shall the glass panels be more than one hundred (100) square inches in area with no dimension exceeding twelve (12) inches.

**919.3. Fireresistive Partition Protectives.**—Wired glass panels in three-quarter (3/4) hour fire doors, smoke stop partitions and fixed vision panels in corridor enclosures of one (1) hour fire resistance rating or less, shall not exceed a total exposed area of one thousand two hundred and ninety-six (1,296) square inches; except as provided in section 917.3.2.

**919.4. Wired Glass in Labeled Doors and Windows.**—One-quarter (1/4) inch wired glass may be used in approved labeled opening protectives with the following maximum sizes:

#### Limiting Size of Wired Glass Panels

	Area in Square Inches	Height In Inches	Width In Inches
Class A door per opening....	0	0	0
Class B door per door*.....	100	12	12
Class C door per light.....	1296	—	—
Class D door per light.....	0	0	0
Class E door per light.....	720	54	44
Class E window per light.....	720	54	54
Class F window per light.....	2916	54	54

\*Listed values shall be permitted in a single door or in each door of a pair of doors.

**919.5. Exitway Protectives.**—Unless specifically required in article 4 to be solid in such locations where unusually hazardous conditions prevail, fire doors in stairway shaft enclosures may be equipped with vision panels which shall be so located as to furnish clear vision of the passageway or approach to the stairway. Such vision panels shall not exceed the size limitations specified for class B doors, or the required protective whichever is less.

## SECTION 920.0. FIRERESISTIVE REQUIREMENTS FOR PLASTER

**920.1. Thickness of Plaster.**—The required thickness of fire-resistive plaster protection shall be determined by the prescribed fire tests for the specified use and type of construction and in accordance with the provisions of section 820 for interior plastering and section 821 for exterior plastering. The thickness in all cases shall be measured from the face of the plaster base when applied directly to masonry walls or from the face of the

lath when applied to fiber board, wood, or gypsum lath and from the back of metal lath.

**920.2. Plaster Equivalents.**—For fireresistive purposes, one-half (1/2) inch of neat gypsum plaster shall be deemed equivalent to three-quarter (3/4) inches of one (1) to three (3) sanded gypsum or one (1) inch portland cement plaster.

**920.3. Noncombustible Furring.**—In fireproof (type 1) and noncombustible (type 2) construction, plaster shall be applied directly on masonry or on an approved noncombustible plastering base and furring.

**920.4. Double Reinforcement.**—Except in solid plaster partitions, or when otherwise determined by the prescribed fire tests, plaster protections more than one (1) inch in thickness shall be reinforced with an additional layer of approved lath imbedded at least three quarter (3/4) inch from the outer surface and fixed securely in place.

**920.5. Plaster Alternates for Concrete.**—In reinforced concrete construction, gypsum or portland cement plaster may be substituted for one-half (1/2) inch of the required poured concrete protection, except that a minimum thickness of three-eighth (3/8) inches of poured concrete shall be provided in all reinforced concrete floors and one (1) inch in reinforced concrete columns in addition to the plaster finish and the concrete base shall be prepared in accordance with section 821.6.

## **SECTION 921.0. FIRESTOPPING**

**921.1. Where Required.**—Firestopping shall be designed and constructed to close all concealed draft openings and to form effectual fire barriers against the spread of fire between stories of every building and in all open structural spaces therein, including the following locations: for the subdivision of attic spaces in section 219; for combustible wall, partition and floor framing in section 877; for ceiling spaces in section 913; for open spaces behind acoustical and other finishes in section 923; for floor sleeper spaces in section 924; for pipe, duct and flue openings in section 1119 and for fire dampers and curtains in section 1812.

**921.2. Firestopping Materials.**—All firestopping shall consist of noncombustible materials including asbestos, brick, terra cotta, concrete, fibrous glass, gypsum, mineral wool, rock wool, steel, iron, metal lath and cement or gypsum plaster, formed

steel of not less than No. 20 U.S. gage, or other approved noncombustible materials, securely fastened in place; except that firestops of two (2) thicknesses of one (1) inch lumber with broken lap joints or of two (2) inch lumber installed with tight joints shall be permitted in open spaces of wood framing.

**921.3. Inspection of Firestopping.**—No firestopping shall be concealed or covered from view until inspected and approved by the building official.

## **SECTION 922.0. INTERIOR FINISH AND TRIM**

Interior finish and interior trim shall for the purpose of complying with the provisions of this section mean those materials that form the exposed interior surfaces of a building and that are part of or affix to walls, fixed or folding partitions, ceilings and other construction elements.

**922.1. Interior Finish.**—Interior finishes and exposed structural or construction materials when classified as provided in section 904.1, shall have a flame-spread rating not greater than that designated by the class prescribed for the various occupancy groups in which they are used, as listed in section 922.1.2. table 9-4. They shall have a smoke density rating not greater than the limits provided for in section 922.1.3.

### **922.1.1. Exceptions to the Flame-Spread Requirements of Section 922.1.**

- a. Finish flooring and floor coverings provided for in section 924.
- b. Vinyl wall coverings less than .006 inch total thickness and other wall coverings and coatings of paper or other materials less than .036 inch total thickness, when applied directly to a noncombustible, or fireretardant treated wood substrate.
- c. Exposed structural members and planking in buildings of type 3A construction, which may be left exposed in any room or space, except in exitways.
- d. These regulations shall not be considered as requiring the installation of interior finish.
- e. When a sprinkler system is provided in any room or space, and is installed in compliance with the construction provisions of article 12, interior finish materials

may be one class higher in flame-spread rating than required by section 922.1.2 table 9-4, but in no case higher than class "C".

**922.1.2. Table 9-4—Interior Finish Flame Spread Limit Requirements.**

Occupancy Group Classification of the Space		Exitways and Shafts	Corridors Providing Access to Exitways(b)	Rooms more than 1500 sq. ft.(a)	Rooms Less than 1500 sq. ft.(a)
High Hazard	A	A	A	B	B
Storage	B1	A	A	B	C
Storage	B2	A	B	B(c)	C
Mercantile	C	A	B	B(c)	C
Industrial	D1	A	A	B	C
Industrial	D2	A	B	B(c)	C
Business	E	A	B	C	C
Assembly	F1a	A	B	B	B(d)
Assembly	F1b	A	B	B(c)	B(c,d)
Assembly	F2	A	B	B(c)	C
Assembly	F3	A	B	B(c)	B(c,d)
Assembly	F4	A	A	B	C
Assembly	F5	A	B	B(c)	B(c,d)
Institutional	H1, H2	A	A	B	B(d)
Residential	L1, L2	A	A	B	B(f)
Residential	L3	B	D(e)	D(e)	D(e)

Notes for table 9-4

- a. In determining the applicable requirements for rooms or enclosed spaces, the occupancy group classification of the room or enclosed space shall be the governing factor, regardless of the occupancy group classification of the building. For the purposes of this table, the area of a room shall be that floor area contained within enclosing construction in which interior doors or other interior openings represent not more than ten (10) per cent of the area of the enclosing construction. Interior doors or windows that are constructed of noncombustible materials and that are self-closing or automatic may be ignored in computing door or opening area. Rooms or spaces that have unprotected openings constituting more than ten (10) per cent of the area of enclosing construction shall not be considered as a room. Interior finish

requirements for rooms are based upon rooms being enclosed in ceiling high partitions. Partitions, to be considered ceiling high, shall extend up to the floor or roof construction above or to a ceiling having at least a three-quarter (3/4) hour fireresistance rating. Partitions that do not comply with this requirement shall not be considered as enclosing the spaces, and the rooms or spaces on both sides thereof shall be considered as one.

- b. Rooms or spaces through which it is necessary for occupants of an adjacent room to pass in order to reach the only exitway shall, for the purposes of this table, be considered as corridors. Where used in corridors, class B finish material shall not extend more than fifty (50) feet between separations of class A finish material that are at least two (2) feet wide.
- c. On the street floor one (1) story buildings in construction type 3 and 4, ceilings, beams, trusses, etc. that are twenty (20) feet or more in height from the floor to their lowest part, may have a class C finish.
- d. Class C interior finish may be used in offices, or groups of offices, whose use is accessory to an occupancy, provided such offices are separated from the occupancy by construction having at least a two (2) hour fireresistance rating.
- e. Class C interior finish may be used in the residential rooms of one (1) and two (2) story motels when there is a direct exitway from each room to the exterior.
- f. Interior finish when used in the following spaces shall be at least Class B:
  - 1. Kitchens, cooking spaces, and pantries in buildings classified in occupancy groups other than L2 and L3.
  - 2. Repair and maintenance rooms.
  - 3. Boiler rooms and incinerator combustion rooms.

**922.1.3. Smoke Density Limitations.** — No material shall be used for interior finish in the following locations if the material develops smoke in greater density than the rating shown, based upon a test conducted in accordance with the provisions of reference standard RS 9-9. Materials used for interior finish that cover not more than twenty (20) per cent of the wall or ceiling area of any room, space, or corridor shall be exempt from the above requirements.

<b>Location or Occupancy</b>	<b>Smoke Developed Rating</b>
Exitways, Corridor providing exitway access, places of public assembly	25
Occupancy groups H1 and H2	50
Rooms in which the net floor area per occupant is ten (10) square feet or less except places of public assembly	100

**922.2. Interior Trim.**—Baseboards, chair-rails, mouldings, trim around openings and other interior trim, not more than twelve (12) inches in width, may be of Class A, B or C materials except trim around fire windows and fire doors shall comply with the requirements of section 917 and section 918 and except that only class A or B materials shall be used for interior trim where interior finish is restricted to class A material. Class D trim having a flame-spread rating not greater than five hundred (500) shall be allowed for trim only where class D material is permitted for interior finish.

**922.3. Coatings.**—Coatings applied in the field by brush or spray shall not be used as flame-spread retardants except on existing surfaces of buildings existing on the effective date of this code, and then only with the express permission of, and in a manner directed by, the building official.

**922.4. Ceiling Construction.**—Ceilings may be suspended below floor or roof construction by means of a framing system of supporting hangers and carrying channels and a supporting grid of strength adequate to support the ceiling material. The hangers and supporting grid shall be of noncombustible materials. In buildings of construction class types 3 and 4, every other hanger supported from wood members shall be attached by a through bolt or clinched through nail. Where, in section 221.1 table 2-1, floor or roof construction is required to have a fireresistance rating, a ceiling having no fireresistance rating may be suspended below the fireresistive construction.

**922.4.1. Luminous Ceilings.**—For the purpose of this section, a luminous ceiling shall be defined as a ceiling consisting of translucent, louvered, egg-crated, mesh, or similar light-diffusing material suspended from the ceiling or structural framework. A suspended ceiling containing less than twenty (20) square feet of translucent, louvered, egg-crated, mesh or similar material in any one hundred (100) square feet of ceiling area shall not be considered a luminous ceiling, and shall be constructed and



installed in accordance with requirements of article 15 for lighting fixtures. Luminous ceilings shall, in addition to the requirements of this section, conform to all of the requirements of sections 923.0 through 925.0.

**922.4.2. Luminous Ceilings of Noncombustible Material.**—Luminous ceilings constructed of glass and/or metal or other noncombustible materials may be used in any location.

- a. Glass used in luminous ceilings, unless it is wire glass or heat-resistant glass as specified below, shall not weigh more than two (2) psf, nor shall any pane be larger than eight (8) square feet in area. If glass used in luminous ceilings is wire glass, or is heat resistant by reason of having a maximum coefficient of expansion of  $36 \times 10^{-7}$  inches per inch per degree C., the glass may be of any weight and any size, limited only by considerations of structural safety.
- b. Luminous ceilings installed below sprinkler heads shall be constructed of a type of noncombustible louver mesh or other open material that will not impede the flow of water from the sprinkler heads over the intended area of coverage. The luminous ceiling shall be constructed so as to provide access to all heads and valves.

**922.4.3. Luminous Ceilings of Combustible Material.**—Luminous ceilings constructed of combustible materials shall not be installed in:

- a. Any exitway or corridor providing access to exitways.
- b. Any room classified in occupancy group H, or any room leading therefrom as defined in section 922.1.2.b.
- c. Any room in which the net floor area per occupant is twenty (20) square feet or less, or any room leading therefrom as defined in section 922.1.2.b.
- d. Luminous ceilings constructed elsewhere than in the spaces listed in a., b. and c. above shall be exempt from the provisions of section 922.1 provided that they comply with the provisions of section 2007.

## **SECTION 923.0. APPLICATION OF INTERIOR FINISH**

Where interior finish is regulated by the requirements of this Code, interior finish materials shall be applied or otherwise fastened in such a manner that they will not fall off when subjected to room temperatures of two hundred (200) degrees F.

or less for thirty (30) minutes, or otherwise become loose through changes in the setting medium from the effects of time or conditions of occupancy.

**923.0.1. Attachment of Interior Finish.**—To be credited with the same rating, interior finish materials that were applied to a substrate when tested shall be applied at the building to an equivalent substrate and shall be cemented or otherwise secured in place in the same manner and with materials equivalent to those used in flame-spread tests conducted in accordance with section 904.1 for the applicable classification.

**923.1. Application to Structural Elements.**—Interior finish materials applied to walls, ceilings or structural elements of a building or structure which are required to be fireresistive or to be constructed of noncombustible component materials, shall be applied directly against the exposed surface of such structural elements, or to furring strips attached to such surfaces with all concealed spaces created thereby firestopped where in excess of ten (10) square feet in area or eight (8) feet in any dimension.

**923.2. Furred Construction.**—Where walls, ceilings, partitions, or other construction elements are required to have a fireresistance rating or are required to be constructed of noncombustible materials, and the interior finish secured to studs or furring shall be permitted only if one or more of the following requirements are met:

- a. The surface of the interior finish facing the concealed space has a class A rating.
- b. The interior finish is applied to a substrate that has a class A rating.
- c. The concealed space is completely filled with noncombustible material.
- d. Where the finish is set out or dropped distances greater than one and three-quarter (1-3/4) inches the finish material is protected on both sides by automatic sprinklers (see section 922.1.1.e.), or is attached to either a noncombustible backing complying with section 923.5, or to furring strips applied directly to such backing as provided in section 923.1.

**923.3. Heavy Timber Construction.**—Interior finish materials may be applied directly to the wood members and decking of heavy timber (type 3-A) construction, where permitted, or to furring strips applied to such members or wood decking as provided in section 923.1.

**923.4. Class B and C Material.**—Interior finish materials, other than class A material, which are less than one-quarter (1/4) inch in thickness shall be applied directly against a noncombustible backing unless the tests under which such material has been classified were made with the materials suspended from the noncombustible backing.

**923.5. Noncombustible Backing.**—Noncombustible backing for interior finish materials shall be a continuous surface with permanently tight joints, equal in area to the area of the finish, and extending completely behind such finish in all directions; and may be of any materials meeting the requirements of this code for noncombustible classification of material under section 903.7.1 or of fire-retardant treated wood. When the noncombustible backing does not constitute an integral part of the structural elements or system, it shall be attached directly to the structural elements or to furring strips as required for the application of finish according to section 923.1, or may be suspended from the structural members at any distance provided concealed spaces created thereby shall be firestopped in accordance with the applicable requirements of this code. Where class C interior finish is applied to a continuous noncombustible backing beneath wood joist construction, the allowable area for firestopping required in section 913.4 may be increased to three thousand (3,000) square feet.

## **SECTION 924.0. COMBUSTIBLE MATERIALS PERMITTED IN FLOOR CONSTRUCTION OF TYPE 1 AND TYPE 2 BUILDINGS**

Except as provided in section 618.0. for stairs and section 418 for theatres and similar places of public assembly (occupancy groups F-1 and F-2), the use of combustible materials in or on floors of type 1 and type 2 buildings shall be as herein specified.

**924.1. Sleepers, Bucks and Grounds.**—Floor sleepers, bucks, nailing blocks and grounds may be constructed of combustible materials, provided the space between the fireresistive floor construction and the flooring is solidly filled with noncombustible materials; or the space under the flooring shall be firestopped in areas of not more than one hundred (100) square feet, provided no such open spaces shall extend under or through permanent partitions or walls.

**924.2. Flooring on Sleepers.**—Wood finish floorings may be attached directly to the embedded or firestopped wood sleepers.

**924.3. Flooring on Fireresistive Arches.**—Wood finish flooring, and wearing surfaces of other approved materials including cork, rubber composition, linoleum, asphalt and composition tile and other materials of similar combustible characteristics one-half (1/2) inch or less thick shall be permitted when cemented directly to the top surface of approved fireresistive construction or cemented directly to a subfloor of wood backed up solidly with noncombustible materials. Combustible insulating boards not more than one-half (1/2) inch thick may be used for sound deadening or heat insulating when attached directly to a noncombustible floor assembly or to wood subflooring which is backed up solidly with fireresistive construction and covered with approved finish flooring.

## **SECTION 925.0. OMITTED**

## **SECTION 926.0. RESTRICTIONS OF EXTERIOR APPENDAGES AND TRIM**

**926.1. Exterior Trim.**—For the purposes of this section, exterior trim shall be defined as any material, other than door and window frames and sash, that is applied to exterior walls and which, if removed or destroyed, will not reduce the structural stability of the building enclosure, and which is installed so as not to reduce the required fireresistance rating of the enclosure. Exterior trim shall include cornices, overhanging eaves, fascias, belt courses, pilasters, surrounds, gutters, leaders, half-timber work, shutters, trellises, etc.

**926.1.1. Gutters and Leaders.**—All gutters and leaders hereafter placed on buildings and structures other than frame (type 4) buildings, one- and two-family dwellings and private garages and similar accessory buildings shall be constructed of noncombustible materials.

### **926.2. Combustible Exterior Trim.**

**926.2.1.** May not be used on buildings required to be of construction types 1 and 2 except that plastics having fireresistance and flame-spread ratings conforming to the requirements of approved light transmitting plastics may be used up to a height of twenty-five (25) feet, provided that such trim covers

not more than five (5) per cent of the surface area of the building enclosure (openings not included) or not more than one thousand (1,000) square feet.

**926.2.2.** May be used to a height of forty (40) feet on buildings of construction type 3, provided that such trim covers not more than ten (10) per cent of the surface area of the building enclosure (openings not included), projects not more than eight (8) inches beyond the outside face of the building enclosure, and has an exterior separation of at least fifteen (15) feet measured from the outermost surface of the trim.

a. Exception.—Cornices or overhanging roofs, when permitted, may project up to three (3) feet beyond the outside face of the building enclosure if they are at least eight (8) inches above the topmost opening, are fire-stopped as required by section 877, and either:

1. have their combustible structural members protected by soffits and fascias of a material or assembly having at least a one (1) hour fire-resistance rating, or
2. have all their combustible members separated from the roof and ceiling construction by construction having the fire-resistance rating required for the exterior wall, with at least four (4) inches of solid noncombustible material below, at the sides, and at the ends of such members.

**926.2.3.** May be used to an unlimited extent in buildings of construction type 4A and 4B on exterior walls that are not required to have a fire-resistance rating.

**926.3. Balconies, Bay Windows, Porticos, Etc.**

**926.3.1.** All balconies, bay and oriel windows attached to or supported by walls of other than frame construction shall be of noncombustible construction, framed with brackets of steel, concrete or other approved noncombustible material, unless specifically exempted in sections 303 and 304 and modified herein.

**926.3.2. Porticos, Porches, Etc.—**Porticos, entranceways, storm enclosures, bay windows, oriel windows, porches, or similar appendages may be constructed of combustible materials or assemblies on buildings of construction type 4B to an unlimited extent, and on buildings of construction type 3A, 3B, 3C and 4A under all the following conditions:

- a. The building is classified in occupancy group L-2 or L-3.
- b. The building is not more than three (3) stories or forty (40) feet high.

- c. The appendage has an exterior separation on all exposed sides of at least fifteen (15) feet, measured from the outermost surface of the appendage.
- d. The appendage is so constructed that its removal or destruction will not reduce the structural stability or fireresistive integrity of the building.
- e. The vertical surface area of the combustible portions of the appendage, including any exterior trim, is not more than ten (10) per cent of the total wall area (windows excluded) of the building.
- f. The appendage has a superficial roof area not exceeding one hundred and fifty (150) square feet and is included in the area limitations of table 2-2 for the entire building.
- g. The appendage is not higher than the sills of the second story windows.
- h. The roof of the appendage has a class A roof covering.
- i. The soffit or ceiling covering the combustible roof framing of the appendage has a one (1) hour fire-resistance rating.
- j. The requirements of h. and i. shall not apply in the case of roofs or awnings over patios or entrance platforms where the area of vertical exposure of the patios or platforms to the outdoors is equal to at least that of the patio or platform area. Plastics shall have fireresistance and flame-spread ratings conforming to the requirements for approved light transmitting plastics. Canvas or other fabric shall be noncombustible or flame-proofed in accordance with the provisions of the code.

**926.4. Existing Combustible Construction.**—Any existing cornice or other exterior architectural elements constructed of wood or similar material to the extent of fifty (50) per cent of its area in any one (1) year if the public safety is not thereby endangered.

**926.5. Wood Veneers.**—Combustible wood veneers shall be permitted by approval of the building official in the First Fire Zone only for uses in accordance with section 303.30. They shall be permitted in the Second Fire Zone when approved by the building official.

## **SECTION 927.0. ROOF STRUCTURES**

All construction erected above the roof of any building or structure located within the First and Second Fire Zones or of

any building or structure more than forty (40) feet in height elsewhere shall be constructed of noncombustible materials except as may be modified in this section.

### **927.1. Scuttles.**

**927.1.1. Size.**—Unless provided with other approved means of access to the roof, every building and structure more than three (3) stories or forty (40) feet in height, except dwellings with peak roofs and all other buildings having roofs with a pitch greater than twenty (20) degrees, shall have an access trap door not less than two (2) by three (3) feet in area, securely attached or anchored to the roof framing, with ladder leading thereto from the top story.

**927.1.2. Construction.**—The trap door or scuttle shall be of fireresistive construction in fireproof (types 1-A and 1-B), and noncombustible (types 2-A, 2-B and 2-C) buildings; and of approved noncombustible materials, or of combustible materials covered on the top, sides, and edges with noncombustible materials in masonry (type 3) and protected frame (type 4-A) buildings.

**927.2. Skylights.**—For the purposes of this section, the term “skylight” shall be construed to include the sash, frames, and glazing of roof monitors and sawtooth roofs.

**927.2.1. Sash and Frames.**—Skylights that are inclined at less than sixty (60) degrees to the horizontal on all buildings of other than construction types 4A and 4B, shall have sash and frames constructed of noncombustible materials, and their glazing shall be as prescribed in 927.2.2 below. Skylights that are inclined at greater than sixty (60) degrees to the horizontal shall have sash and frames constructed as required for windows, and their glazing shall be as required for windows. Glass, glass blocks, or plastic used in skylights shall be designed and constructed to withstand the same live loads as required for roofs plus any concentrated live loads required herein. In foundries or buildings where acid fumes, deleterious to metal are incidental to the use of the building, treated wood or other approved noncorrosive materials shall be permitted.

### **927.2.2. Glazing.**

- a. **Skylights over Stairways and Shafts.**—Skylights placed over stairways and shafts shall be glazed with plain glass not more than one-eighth ( $1/8$ ) inch thick or unreinforced plastic not more than three-sixteenths ( $3/16$ ) inches thick.
- b. **Skylights over Other Spaces.**—Skylights in all locations

other than over stairways and shafts shall be glazed with one-quarter (1/4) inch wired glass, plain glass, glass block, or plastic of material and installation complying with 927.2.2 c. below.

c. Plastic.—Plastic used for the glazing of skylights other than skylights over stairways and shafts shall be approved light transmitting plastic. The aggregate area of skylight openings, other than over stairways and shafts, shall not exceed thirty (30) per cent of the floor area or any room or space sheltered by the roof in which they are located. The edges of plastic, if exposed, shall be protected by metal or other noncombustible material. Skylights in which plastic is used, if on roofs having a pitch of twenty (20) degrees to the horizontal or less, shall be constructed in accordance with the following:

1. The area within the curbs of each skylight shall not exceed five (5) square feet, except that this area may be of any size, limited only by other provisions of this section, if the opening is protected on all sides by a noncombustible railing thirty-six (36) inches in height complying with the provisions of section 710.3.1 for railings; or the skylight is subdivided into areas of five (5) square feet or less by noncombustible muntins or bars capable of supporting a live load of three hundred (300) pounds at any point; or a noncombustible screen or grid capable of supporting a load of three hundred (300) pounds over any one (1) foot by two (2) foot area, is provided above, integral with, or not more than three (3) feet below the skylight, with the wire or bars spaced into areas of five (5) square feet or less (if above the roof, the wire shall be of corrosionresistive metal.)
2. There shall be a minimum clear distance of three (3) feet between skylights.

**927.2.3. Separation of Skylights from Structures.**—There shall be at least ten (10) feet between a plain glass or plastic skylight and any door in a stair bulkhead located above the roof in which the skylight is located, and at least ten (10) feet between such a skylight and any opening in any roof structure or other wall above the roof not equipped with an opening protective. On buildings up to one hundred (100) feet in height there shall be at least one (1) foot from such a skylight to the outside face of an exterior wall facing on a frontage space.



**927.2.4 Screens.**—Plain glass skylights shall be protected on their underside by noncombustible screens having a mesh not smaller than three-quarter ( $3/4$ ) inches by three-quarter ( $3/4$ ) inches nor larger than one (1) inch by one (1) inch of at least No. 12 B&S gage wires. The screen shall be installed tight against the roof opening or shall project on all sides for a distance of not less than the distance of the screen below the glass, and shall be of such material and construction so as to support a load of three hundred (300) pounds over any one (1) foot by two (2) foot area. The provisions for wire glass or screen protection shall not apply to glass block skylights or to greenhouse construction.

**927.3. Penthouses.**—Except as provided below, the enclosure walls of penthouses shall comply with the requirements for exterior walls of section 221.1 table 2-1 for the construction class of the building in which they are erected. Roofs of penthouses shall comply with the requirements for roof construction of section 221.1 table 2-1 and section 928.

**927.3.1. Recessed Walls.**—When the exterior wall of a penthouse is recessed five (5) feet or more from the exterior wall of the next lower story which is required to have a greater fire-resistance, it may be constructed with a fire-resistance rating of not less than one and one-half ( $1-1/2$ ) hours, covered on the outside with noncombustible, water-proof material and supported on protected steel or reinforced concrete construction.

**927.3.2. Doors, Frames and Sash.**—Doors, frames and window sash except where otherwise specifically required to be fireproof or fire-resistive under this code, shall be constructed the same as other similar elements in the building or structure.

**927.4. Other Roof Structures.**—Roof structures other than penthouses as defined in article 2 shall comply with the following provisions:

**927.4.1. Noncombustible Materials.**—Unless constructed of masonry or reinforced concrete in accordance with article 8, roof structures erected on buildings and structures of fireproof and noncombustible (types 1 and 2) construction shall be enclosed in walls of noncombustible materials having a fire-resistance rating of not less than three-quarter ( $3/4$ ) hours, protected with weather-resistive roof and wall coverings complying with section 929.

**927.4.2. Combustible Materials.**—Roof structures erected on the roof of masonry enclosed buildings (type 3) and protected

frame (type 4-A) may be constructed of combustible materials protected to afford a three-quarter ( $3/4$ ) hour fire-resistance rating covered on the outside with approved roofing materials.

**927.4.3. Bulkheads** shall be constructed of noncombustible materials having a one (1) hour fire-resistance rating, except that in buildings of construction type 4-B, they may be constructed of combustible materials having a one (1) hour fire-resistance rating.

**927.5. Mansards and Sloping Roofs.**—Steep roofs having a slope of more than sixty (60) degrees to the horizontal shall be constructed of material having the same fire-resistance rating as required for an exterior nonbearing wall of the building of which it is a part. When the slope is sixty (60) degrees or less to the horizontal, the sloping roof shall be constructed as required for the roof of the building. Where the back of a false mansard is exposed to the outdoors, the back shall be covered with noncombustible material or with roof coverings as required for the roof of the building.

**927.6. Dormer Windows.**—Roofs of dormers shall be of the same type of construction and have roof covering of the same class as required for the roof of the building on which they are located. The walls of dormers shall be constructed of materials having the same fire-resistance rating as required for nonbearing exterior walls of the building on which they are located; except that in buildings of construction types 3A, 3B, 3C and 4A, the walls may be constructed of combustible framing provided that the outside face of the framing is protected with noncombustible sheathing and the aggregate area of all such dormer walls, including openings therein, does not exceed twenty (20) per cent of the roof area.

#### **927.7. Water Tanks.**

**927.7.1. Supports.**—Water tanks having a capacity of more than five hundred (500) gallons placed in or on a building for the storage of potable water supplies and for use in the building services including air conditioning and fire prevention purposes, shall be supported on masonry, reinforced concrete, steel or other approved noncombustible framing or on timber conforming to heavy timber mill construction (type 3-A); provided that when such supports are located within the building, they shall be fire-protected as required for fireproof (type 1-A) construction.

**927.7.2. Emergency Discharge.**—A pipe or outlet shall be located in the bottom, or in the side close to the bottom, or the tank shall be fitted with a quick-opening valve to enable the

contents to be discharged in an emergency to a suitable drain complying with article 17.

**927.7.3. Location.**—No tank shall be located over or near a stairway or elevator shaft unless a solid roof or floor deck of the necessary strength is constructed underneath the tank.

**927.7.4. Tank Cover.**—All unenclosed roof tanks exposed to the weather shall have approved covers sloping toward the outer edges.

**927.7.5. Hoop and Strap Protection.**—When metal hoops are used in the construction of wood tanks, they shall be protected with acceptable corrosion-resistive coatings or shall be manufactured from approved corrosion-resistive alloys.

**927.8. Cooling Towers.**

**927.8.1. Located in Fire Zones.**—Within First and Second Fire Zones, cooling towers erected on the roofs of buildings shall be constructed of noncombustible materials, except that drip bars may be of wood. If the tower is provided with automatic sprinkler protection complying with the construction provisions of article 12, filling and drift eliminators may be of combustible materials.

**927.8.2. Located Outside Fire Zones.**

- a. When located on a building three (3) stories or forty (40) feet in height or less of construction types 1 and 2, cooling towers may be constructed of combustible materials provided they are not more than fifteen (15) feet high and do not exceed seven hundred and fifty (750) square feet in area.
- b. When located on the ground and not exceeding three (3) stories or forty (40) feet in height of fifteen hundred (1,500) square feet in area, cooling towers may be constructed of combustible material provided they are protected by a noncombustible screen, fence, or wall at least twenty (20) feet from the tower and at least seven (7) feet high.

**927.9. Miscellaneous Roof Structures.**—Except as herein specifically provided, all towers, spires, dormers or cupolas shall be erected of the type of construction and fireresistance rating required for the building to which they are accessory as regulated by section 221.1 table 2-1 and section 221.2 table 2-2; except that when the height of such appurtenant structures exceeds eighty-five (85) feet above grade or when the area at any horizontal section of the tower, spire, dormer or cupola exceeds two

hundred (200) square feet or when it is used for any purpose other than as a belfry or architectural embellishment, the structure and its supports shall be of fireproof (type 1) construction or noncombustible (type 2) construction. Radio and television towers and antennae shall be constructed to comply with sections 427 and 428.

**927.9.1. Exceptions**—The following roof structures may be constructed of combustible material if less than twelve (12) feet high above the roof: antenna supports; flagpoles; clothes drying frames; duckboarding or platforms that do not cover more than twenty (20) per cent of the roof area at that level.

## **SECTION 928.0. ROOF COVERINGS**

All approved roof coverings shall be classified as A, B, or C on the basis of their resistance to exterior fire exposure as listed in reference standard RS 9-3 or as determined by tests made in conformance with reference standard RS 9-4 for those not listed.

**928.1. Existing Roofs.**—The repair of existing roofs shall comply with the provisions of section 106 but in no case shall more than twenty-five (25) per cent of the roof covering of any building be replaced in a period of twelve (12) months unless the entire roof covering is made to conform to the requirements for new roofing.

**928.2. Within the Fire Limits.**—Within the limits of the First and Second Fire Zones, all roof coverings shall be of asbestos, brick, concrete, metal, slate, tile, prepared asphalt, asbestos felt, or laminated felt roofing finished with asphalt, slag, gravel or similar noncombustible, moisture-resistant materials or approved combinations of materials, complying with the requirements of section 903.5 for class A or B roof coverings or their approved equivalent, except class C roof covering may be placed on buildings classified in occupancy group L when not more than three (3) stories or forty (40) feet in height.

**928.3. Outside Fire Limits.**—Class C roof covering may be used on buildings permitted by this code to be of type 4A and 4B construction. The use of roofing having no rating is prohibited except as provided in section 928.1.

**928.4. Roof Decking and Sheathing.**

**928.4.1. Combustible Decking.**—Unless attached directly to noncombustible framework, all roof coverings shall be applied to a closely fitted deck; except as provided in section 855.7.2

for wood shingles and handsplit shakes to the extent permitted in section 928.3, may be applied to wood slats.

**928.4.2. Fire and Party Wall Restrictions.**—No wood planking, sheathing, or other combustible decking when used in roof construction shall extend through or over any party wall or fire wall or across any lot line.

**928.5. Roof Insulation.**—Refer to section 903.5.3.

**928.6. Grounding of Metal Roofs.**—Whenever, because of hazard resulting from electrical equipment or apparatus located thereon, or because of proximity to power lines, or for any other reason, it is deemed necessary by the building official, metal roofs shall be grounded by bonding together each course or strip and the bonding conductor or conductors shall be extended to and attached in an approved manner to the grounding electrode used to ground the electrical system within the building on which such metal roofing is applied. The conductors used to bond courses or strips of metal roofing together, or any conductor extended for grounding to the grounding electrode, shall have no greater resistance than the conductor used to ground the electrical system within the building.

**928.6.1. Alternate Methods of Grounding Metal Roofing.**—Alternate methods of grounding metal roofing may be used provided they are at least equal in performance to the methods prescribed herein, and further provided that such desired method is first submitted to and approved by the building official.



## REFERENCE STANDARD RS 9 FIRERESISTIVE CONSTRUCTION REQUIREMENTS

### List of Reference Standards

- RS 9      AIA                      1968  
Fireresistance Ratings
- ASTM E 84              1968  
Standard Method of Test for Surface Burning  
Characteristics of Building Materials
- ASTM E 108            1965  
Standard Methods of Fire Tests of Roof Coverings
- ASTM E 119            1969  
Standard Methods of Fire Tests of Building Con-  
struction and Materials
- ASTM E 136            1965  
Method of Test for Determining Noncombustibility  
of Elementary Materials
- ASTM E 152            1966  
Standard Methods of Fire Tests of Door Assemblies
- ASTM E 163            1965  
Standard Methods of Fire Tests of Window Assemblies
- AWPA C 20            1963  
Structural Lumber—Fire Retardant Treatment by  
Pressure Processes
- AWPA C 27            1963  
Plywood—Fire Retardant Treatment by Pressure  
Processes
- NFPA      No. 80      1968  
Installation of Fire Doors and Windows

NFPA No. 701 1969  
Standard Methods of Fire Tests for Flame-resistant  
Textiles and Films

US Federal Test Method Std. No. 191 1968  
Method 5190 Textile Test—Burning Rate of Cloth;  
30 degree angle

- RS 9-1** AIA 1968  
Fireresistance Ratings
- RS 9-2** ASTM E 119 1969  
Standard Methods of Fire Tests of Building Con-  
struction and Materials
- RS 9-3** Roof Covering Classifications  
See Table Following
- RS 9-4** ASTM E 108 1965  
Standard Methods of Fire Tests of Roof Coverings
- RS 9-5** ASTM E 152 1966  
Standard Methods of Fire Tests of Door Assemblies
- RS 9-6** ASTM E 163 1965  
Standard Methods of Fire Tests of Window Assemblies
- RS 9-7** NFPA No. 80 1968  
Installation of Fire Doors and Windows
- RS 9-8** ASTM E 136 1965  
Method of Test for Determining Noncombustibility of  
Elementary Materials
- RS 9-9** ASTM E 84 1968  
Standard Method of Test for Surface Burning Char-  
acteristics of Building Materials
- RS 9-10** AWPA C 20 1963  
Structural Lumber—Fire Retardant Treatment by  
Pressure Processes



- RS 9-11** AWWPA C 27 1963  
Plywood—Fire Retardant Treatment by Pressure Processes
- RS 9-12** NFPA No. 701 1969  
Standard Methods of Fire Tests for Flame-resistant Textiles and Films
- RS 9-13** US Federal Test Method Std. No. 191 1968  
Method 5190 Textile Test—Burning Rate of Cloth; 30 degree angle

# RS 9-3

## Roof Covering Classifications

Description	Maximum Incline (In. to Ft.)	Class A	Class B	Class C
Brick Concrete		(1) Brick, 2-1/4 inch thick. (2) Reinforced portland cement, 1 inch thick. (3) Concrete or clay floor or deck tile, 1 inch thick.		
Tile		(4) Flat or French-type clay or concrete tile, 3/8 inch thick with 1-1/2 inches or more end lap and head lock, spacing body of tile 1/2 inch or more above roof sheathing, with underlay of one layer of Type 15 asphalt-saturated asbestos felt or one layer of Type 30 or two layers of Type 15 asphalt-saturated rag felt.		
		(5) Clay or concrete roof tile, Spanish or Mission pattern, 7/16 inch thick, 3 inch end lap same underlay as above.		
		(6) Slate, 3/16 inch thick, laid American method.		

# Roof Covering Classifications

## Maximum Incline (In. to Ft.)

### Description (In. to Ft.) Class A Class B Class C

**Metal Roofing**      12      Sheet roofing of 16 oz. copper or of 30 gage steel or iron protected against corrosion. Limited to noncombustible roof decks or noncombustible roof supports when no separate roof deck is provided.

Sheet roofing of 16 oz. copper or of 30 gage steel or iron tile, protected against corrosion; or shingle pattern roofings with underlay of 1 layer of Type 15 saturated asbestos felt or 1 layer of Type 30 or 2 layers of Type 15 asphalt-saturated rag felt.

Sheet roofing of 16 oz. copper or of 30 gage steel or iron tile, protected against corrosion; or shingle pattern roofings, either without underlay or with underlay of rosin-sized paper.

Zinc sheets or shingle roofing with an underlay of 1 layer of Type 30 or 2 layers of Type 15 asphalt-saturated rag felt or 1 layer of 14 lbs. unsaturated or 1 layer of Type 15 asphalt-saturated asbestos felt.

**Cement-Asbestos Shingles**      Exceeding 4      Laid to provide 2 or more thicknesses over 1 layer of Type 15 asphalt-saturated asbestos felt.

Laid to provide 1 or more thicknesses over 1 layer of Type 15 asphalt-saturated asbestos felt.

**Wood Shingles**      Fire-retardant treated red cedar wood shingles and shakes installed as a prepared roof covering. Shakes are to be provided with an underlayment of at least 1 layer of labeled Type 15 asphalt organic felt.

RS 9-3 (Table)



**CHIMNEYS, FLUES AND VENT PIPES**

1000.0	Scope	1012.0	Vent Connectors
1001.0	Definitions	1013.0	Fireplaces
1002.0	Plans and Specifications	1014.0	Cupola Chimneys
1003.0	Performance Test and Acceptance Criteria	1015.0	Incinerator Charging Chutes
1004.0	Kinds of Chimneys	1016.0	Incinerator Chimneys
1005.0	Appliances Requiring Chimneys	1017.0	Incinerator Chimney Connectors
1006.0	Existing Buildings	1018.0	Duct and Pipe Shafts
1007.0	Factory-Built Chimneys	1019.0	Construction of Metal Ducts and Vents
1008.0	Masonry Chimneys	1020.0	Spark Arrestors
1009.0	Metal Chimneys	1021.0	Exhaust Gases from Internal Combustion Engines
1010.0	Chimney Connectors (Smokepipes)	RS-10	Reference Standards
1011.0	Vent Systems		

**TABLES**

10-1	1012.3.1.	Vent Connector Clearances for Gas Appliances
10-2	1012.4.1.	Reduced Clearances
10-3	1015.3.1.	Minimum Size of Charging Chutes
10-4	1019.2.1.	Metal Duct and Vent Construction Other than Dwellings
10-5	1019.3.2.	Ducts for Dwellings

**SECTION 1000.0. SCOPE**

The provisions of this article shall control the design and construction of all chimneys and gas vents hereafter erected or altered in all buildings and structures.

**1000.1. Other Standards.**— Unless otherwise specifically provided herein, conformity to the applicable standards for chimney construction and gas vents listed in Reference Standard RS-10 shall be deemed to meet the requirements of this Code.

**1000.1.1. Gas Code Adopted.**— Gas vents required for appliances or equipment using fuel gases of any kind such as natural gas, manufactured gas, undiluted liquefied petroleum gases, liquefied petroleum gas-air mixtures, or mixtures of any of these gases shall comply with the requirements of the Massachusetts Code for Installation of Gas Appliances and Gas Piping, established under Chapter 737, Acts of 1960.

**1000.2. Minor Repairs.**—Minor repairs for the purpose of maintenance and upkeep which do not increase the capacity of heating apparatus or appliances or which do not involve structural changes in the permanent chimney and gas vents of a building may be made without a permit.

## **SECTION 1001.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.

## **SECTION 1002.0. PLANS AND SPECIFICATIONS**

The structural plans and specifications shall describe in sufficient detail, the location, size and construction of all chimneys, gas vents and ducts and their connections to boilers, furnaces, gas appliances and fireplaces. The thickness and character of all insulation materials, clearances from walls, partitions and ceilings and proximity of heating devices and equipment to wall openings and exitways shall be clearly shown and described.

**1002.1. Methods of Venting.**—Chimney or gas vent systems shall be so engineered and constructed as to develop a positive flow adequate to remove all combustion flue gases to the outside atmosphere.

**1002.2. Engineered Vent System.**—The requirements specified in the following sections: 1003. through 1012. shall not necessarily govern where standard engineering methods have been used to design the chimney or vent system.

## **SECTION 1003.0. PERFORMANCE TEST AND ACCEPTANCE CRITERIA**

The building official may require a test or tests of any chimney or gas vent to insure fire safety and the removal of smoke and products of combustion.

**1003.1. Acceptance Criteria.**—The system shall be accepted if the following three conditions are fulfilled:

- a. There shall be no continuous spillage at the draft hood when any one or combination of appliances connected to the system is in operation;
- b. Temperature on adjacent combustible surfaces shall not be raised more than limits acceptable to accredited authoritative testing agency; and

- c. Condensation shall not be developed in a way that would cause deterioration of the vent or drip from joints or bottom end of vent.

**1003.1.1. Approved Installations.**—Factory-built chimneys and gas vents which have been tested and approved by an accredited authoritative testing agency shall be accepted as complying with the requirements of item 2 of section 1003.1 when installed in accordance with their specified clearances.

**1003.2. Smoke Test.**—When required by the building official to determine the tightness of chimney construction, a smoke test shall be made. The equipment, materials, power and labor necessary for such test shall be furnished by, and at the expense of, the owner or holder of the work permit. If the test shows any evidence of leakage or other defects, such defects shall be corrected in accordance with the requirement of this article and the test shall be repeated until the results are satisfactory.

**1003.2.1. Method of Test.**—The chimney shall be filled with a thick penetrating smoke produced by one or more smoke machines, or smoke bombs, or other equivalent method. As the smoke appears at the stack opening on the roof, such opening shall be tightly closed and a pressure equivalent to a one-half (1/2) inch column of water measured at the base of the stack, shall be applied. The test shall be applied for a length of time sufficient to permit the inspection of the chimney.

## **SECTION 1004.0. KINDS OF CHIMNEYS**

Chimneys as used in this article shall be classified as:

Factory-built chimneys.

Masonry chimneys (concrete, brick and stone).

Metal chimneys (smokestacks).

## **SECTION 1005.0. APPLIANCES REQUIRING CHIMNEYS**

All heating appliances, except electric and gas-fired appliances specifically exempted by the provisions of section 1011, shall be connected to chimneys which conform to the provisions of this article. Chimneys shall be used for venting the following types of appliances.

- a. Incinerators, except as noted in section 1005.1.

- b. Appliances which may be converted readily to use solid or liquid fuels.
- c. Combination gas-oil burning appliances.
- d. Appliances listed for use with chimneys only.
- e. Oil-fired appliances and equipment except as exempted in section 1011.
- f. See Section 1127 for requirements for restaurant cooking appliances.

**1005.1. Exception.**—Metal pipe not less than No. 20 U.S. standard gage galvanized steel or other equivalent noncombustible corrosion-resistant material may be used for venting incinerators installed in locations such as open sheds, breezeways, or carports, provided the metal pipe is exposed and readily examinable for its full length and suitable clearances are maintained.

## **SECTION 1006.0. EXISTING BUILDINGS**

**1006.1. Adjoining Chimneys.**—Whenever a building is erected, enlarged, or increased in height so that any portion of such building, except chimneys or vents, extends higher than the top of any previously constructed chimneys within a horizontal distance of twenty-five (25) feet, the owner of such new or altered building shall have the responsibility of altering such chimneys to make them conform with the requirements of section 1008. A chimney that is no longer connected with a fireplace or combustion or other equipment for which a chimney was required, shall be exempt from this requirement. Alterations shall be accomplished by one of the following means or a combination thereof:

- a. Carry up the previously constructed chimneys to the height required in section 1008.
- b. Offset such chimneys to a minimum distance horizontally beyond twenty-five (25) feet from the new or altered building, provided that the new location of the outlet of the offset chimney shall otherwise comply with the requirements of this article.

**1006.2. Adjoining Gas Vents.**—Whenever a building is erected, enlarged, or increased in height so that any portion of such building, except chimneys or vents, extends above the top of a previously constructed gas vent within ten (10) feet, the owner of the new or altered building shall have the responsi-



bility of altering such gas vents that have their outlets within ten (10) feet measured horizontally, of any part of the newly erected building. Such alterations shall be at the expense of the owner of the new or altered building and shall be accomplished by one of the following means or a combination thereof:

- a. Carry up such previously constructed vents from gas-fired equipment to the height required in section 1011.
- b. Offset such gas vents to a distance of more than ten (10) feet from the new or altered building, provided that the new location of the outlet of the offset gas vent shall comply with the requirements of this article.

**1006.3. Protection of Draft.**—After the alteration of a chimney as required by sections 1006.1. and 1006.2. above, it shall be the responsibility of the owner of the new or altered building to provide any mechanical equipment or devices necessary to maintain the proper draft in the equipment.

**1006.4. Written Notification.**—The owner of the new or altered building shall notify the owner of the building affected in writing at least forty-five (45) days before starting the work required and request written consent to do such work. Such notice shall be accompanied by plans indicating the manner in which the proposed alterations are to be made.

**1006.4.1. Approval.**—The plans and method of alteration shall be subject to the approval of the building official.

**1006.5. Refusal of Consent.**—If consent is not granted by the owner of the previously constructed building to do the alteration work required by sections 1006.1., 1006.2. and 1006.3., such owner shall signify his refusal in writing to the owner of the new or altered building and to the building official; and the owner of the new or altered building shall thereupon be released from any responsibility for the proper operation of the equipment due to loss of draft and for any health hazard or nuisance that may occur as a result of the new or altered building. Such responsibilities shall then be assumed by the owner of the previously constructed building. Likewise, should such owner neglect to grant consent within forty-five (45) days from the date of written request or fail to signify his refusal, he shall then assume all responsibilities as prescribed above.

**1006.6. Procedure.**—It shall be the obligation of the owner of the new or altered building to:

- a. Schedule this work so as to create a minimum of disturbance to the occupants of the affected building.

- b. Provide such essential services as are normally supplied by the equipment while it is out of service.
- c. Where necessary, support such extended chimneys or gas vents and equipment from his building or carry up such chimneys or vents within his building.
- d. Provide for the maintenance, repair, and/or replacement of such extensions and added equipment.
- e. Make such alterations of the same material as the original chimney or gas vent so as to maintain the same quality and appearance, except where the owner of the chimney or vent affected shall give his consent to do otherwise.

**1006.7. Existing Violations.**—Any existing violations on the previously constructed equipment shall be corrected by the owner of the equipment before any equipment is added or alterations made at the expense of the owner of the new or altered building.

## **SECTION 1007.0. FACTORY-BUILT CHIMNEYS**

Factory-built chimneys that have been tested and approved by an accredited authoritative agency shall be installed in accordance with the clearance and details of their approval and the manufacturer's instructions.

## **SECTION 1008.0. MASONRY CHIMNEYS**

**1008.1. Classification.**—For the purpose of determining the requirements for the construction of a masonry chimney, chimneys shall be classified according to the following sub-sections.

**1008.1.1. Low Temperature.**—Chimneys constructed to safely remove products of combustion having a temperature not more than one thousand (1000) degrees F., and for use only with residential heating appliances, low temperature heat producing appliances and low-heat industrial appliances, shall be classified as low temperature chimneys.

**1008.1.2. Medium Temperature.**—Chimneys constructed to safely remove products of combustion having a temperature not more than two thousand (2000) degrees F., and for use with medium-heat or low-heat industrial appliances, shall be classified as medium temperature chimneys.

**1008.1.3. High Temperature.**—Chimneys constructed to safely remove products of combustion having temperatures above two

thousand (2000) degrees F., and for use with high-heat, or other industrial appliances, shall be classified as high temperature chimneys.

**1008.2. Masonry Chimney Construction.**—Masonry chimneys for solid and liquid fuel-fired equipment and appliances shall be constructed of masonry, reinforced concrete, or other approved noncombustible materials; and may be erected as free standing or as constituting an integral part of a wall, or may be enclosed within a structure without constituting a component part thereof. In every case a chimney shall be wholly supported on fireresistive construction or an approved foundation complying with article 7 and shall not be designed to support any direct load other than its own weight.

**1008.2.1. Concrete Block.**—Concrete block masonry shall not be used in an independent or free-standing chimney nor in chimneys bonded to walls more than three stories in height.

**1008.3. Low Temperature Chimneys.**

**1008.3.1. Solid Masonry.**—When constructed of solid masonry the walls shall not be less than eight (8) inches thick, except as herein provided in dwellings and small business buildings.

**1008.3.2. Reinforced Concrete.**—When constructed of reinforced concrete the walls shall not be less than six (6) inches thick, except as provided for dwellings.

**1008.3.3. Dwellings.**—In residential buildings (occupancy groups L-2 and L-3), the walls of a chimney in which the area of the flue is not more than two hundred (200) square inches may be of solid masonry or reinforced concrete not less than four (4) inches thick when provided with a fire clay lining.

**1008.3.4. Lining.**—Low temperature masonry chimneys with less than eight (8) inch walls shall be lined with an approved flue lining that conforms to the requirements of this section and the outside face of interior walls shall be smoothly parged or stuccoed so as to be gas tight, or the flue walls within the building shall be eight (8) inches thick.

**1008.3.5. Flue Lining Materials.**—Flue linings shall be made of fire clay or other approved refractory materials other than shale, capable of withstanding the action of flue gases and of resisting the temperatures to which they are subjected but not less than two thousand (2000) degrees F. without softening or cracking. The thickness of the shell of flue linings shall be not less than five-eighths (5/8) inch.

**1008.3.6. Flue Lining Construction.**—Flue linings shall be constructed in advance of the chimney and shall start from a point not less than eighteen (18) inches below the inlet of the smokepipe or throat of a fireplace. The lining shall be constructed as nearly vertical as possible and shall extend not less than four (4) inches above the top or cap of the flue.

**1008.4. Medium Temperature Chimneys.**

**1008.4.1. Solid Masonry.**—When constructed of solid masonry, the walls shall be not less than eight (8) inches thick and shall be lined as provided in this section.

**1008.4.2. Reinforced Concrete.**—When constructed of reinforced concrete the walls shall be not less than six (6) inches thick with approved lining.

**1008.4.3. Lining.**—Medium temperature masonry chimneys shall be lined with not less than four and one-half (4-1/2) inches of fire brick laid up in fire clay mortar from at least two (2) feet below to not less than twenty-five (25) feet above inlet opening to the chimney; or the walls shall be of double-wall construction with an intervening air space of not less than two (2) inches.

**1008.5. High Temperature Chimneys.**—All high temperature masonry chimneys shall be built with double masonry or double reinforced concrete walls, each of the same thickness required for medium temperature chimneys, with an intervening air space of not less than two (2) inches; or of a single wall with an interior metal chimney and intervening air space. The inside face of the interior wall of double-wall construction shall be of fire brick at least four and one-half (4-1/2) inches thick laid in fire clay or approved high temperature cement mortar; and the interior metal chimney shall be lined as specified in section 1009.5.

**1008.6. General Requirements.**

**1008.6.1. Chimney Height.**—All chimneys shall extend at least three (3) feet above the adjacent roof, and at least two (2) feet above any roof ridge within ten (10) feet thereof. If the height above the roof is more than four (4) times the minimum dimension, the chimney shall be braced and anchored to the roof framing.

**1008.6.2. Chimney Caps.**—All masonry chimneys shall be capped with concrete, terra cotta tile or other approved noncombustible weatherproof material; or a sloped wash shall be provided from the outside of the chimney to the projecting lining specified in section 1008.3.6.

**1008.6.3. Chimney Supports.**—All masonry chimneys shall rest on a foundation located on permanently undisturbed soil or shall be supported on fireresistive construction; and no such chimney shall rest on or be hung or otherwise supported from combustible floor or wall construction except as provided in section 1007.0. No masonry chimney shall be corbeled from hollow or cavity wall construction, nor from a wall built to hollow masonry units; and the corbeling of chimneys shall conform to the requirements of section 839.1. Masonry chimneys erected outside of frame dwellings shall be anchored to the stud walls at each floor level or at vertical intervals of not more than ten (10) feet.

**1008.6.4. Clearances.**—Combustible framing shall be trimmed away from all flues and chimneys, and no combustible material shall be placed within two (2) inches of any chimney, nor within six (6) inches of any inlet opening to such chimney. Finished flooring shall have not less than one-half (1/2) inch clearance from the chimney walls.

**1008.6.5. Firestopping.**—The space about a chimney shall be fire-stopped at each floor and ceiling level with incombustible material, unless such space is treated as a vertical opening and is enclosed as provided in Article 9.

**1008.6.6. Supports.**—In case wooden beams or other woodwork are supported on a masonry wall or pier bonded to a chimney, such woodwork shall not be nearer than four (4) inches from the chimney. For the purposes of this section a chimney shall consist of the flue or flues, the lining, if any, and the walls to the required thickness.

**1008.6.7. Size.**—The passageway within the chimney shall be ascertained to be open to the exterior and shall be of adequate size to remove all the products of combustion of the appliances attached thereto.

**1008.6.8. Thickness and Shape.**—For chimneys larger than one hundred twenty (120) square inches, except as specified in section 1008.3.3., the walls shall be not less than eight (8) inches thick in any case. No change in the size or shape of a chimney shall be made within six (6) inches of the roof framing through which it passes.

**1008.7. Cleanouts and Maintenance.**—Whenever a new chimney is completed or an existing chimney is altered, it shall be cleaned and left smooth on the inside. If the chimney is constructed of masonry or tile the interior mortar joints must be

left smooth and flush. Cleanouts with a gas tight door or other approved devices shall be provided at the base of all chimneys to enable the passageways to be maintained and cleaned.

## **SECTION 1009.0. METAL CHIMNEYS**

### **1009.1. Thickness of Metal.**

**1009.1.1. Exterior Metal Chimneys.**—Exterior metal chimneys shall be of adequate thickness to resist all wind stresses specified in article 7 but shall be not less than one-eighth ( $1/8$ ) inch thick for diameters up to three (3) feet, three-sixteenths ( $3/16$ ) inch thick for diameters up to four (4) feet and not less than one-quarter ( $1/4$ ) inch thick for larger diameters.

**1009.1.2. Interior Metal Chimneys.**—Interior metal chimneys shall be constructed of metal not less than No. 16 U.S. gage for areas not more than one hundred fifty-five (155) square inches; No. 14 U.S. gage for areas not more than two hundred (200) square inches; No. 12 U.S. gage for areas not more than two hundred and fifty-five (255) square inches; and not less than No. 10 U.S. gage for greater areas.

**1009.2. Construction.**—All metal chimneys shall be riveted or welded construction and all exterior metal chimneys shall be securely guyed, braced, anchored and supported. They shall be galvanized, painted with an approved paint, or constructed of approved corrosion-resistive alloys.

**1009.3. Cleanout.**—A cleanout shall be provided at the base of every metal chimney.

**1009.4. Metal Chimney Foundation.**—A metal chimney erected on the exterior of a building or structure shall be supported on an independent substantial masonry or reinforced concrete foundation. Interior metal chimneys may be supported on fire-proof (type 1-A) construction at intermediate levels.

**1009.5. High Temperature Lining.**—When metal chimneys are used to remove high temperature combustion gases they shall be lined with four and one-half ( $4-1/2$ ) inches of firebrick laid in fire clay mortar. Such lining shall extend at least twenty-five (25) feet above the smokepipe entrance.

**1009.6. Height of Metal Chimney.**—All metal chimneys shall extend to a height of not less than four (4) feet above any roof within twenty-five (25) feet, or any roof ridge within ten (10) feet horizontally thereof, except as provided in section 1014 for high temperature chimneys.

**1009.7. Metal Chimney Clearances.**—Every metal chimney or part thereof erected on the exterior of a building, shall have a clearance from a wall of frame or combustible construction of not less than twenty-four (24) inches and of not less than four (4) inches if the wall is of noncombustible construction. No such stack shall be located less than twenty-four (24) inches in any direction from a wall opening or required exitway, or fire escape.

**1009.8. Interior Metal Chimney Enclosures.**—Every interior metal chimney or part thereof, erected within a multi-story building shall be enclosed with walls of not less than three (3) hours fireresistance in all stories above that in which the appliance served thereby is located. Where the metal chimney passes through a combustible roof, it shall be guarded by a galvanized metal or other approved noncombustible, ventilating thimble that extends at least nine (9) inches below and above the roof construction. The thimbles shall be of a size to provide clearance on all sides of the metal chimney of not less than six (6) inches for low heat appliances and not less than eighteen (18) inches for medium and high heat appliances as defined in article 11, unless the metal chimney is insulated and protected to prevent a temperature of more than two hundred and fifty (250) degrees F. on the exterior surface.

**1009.9. Prohibited Location.**—No interior metal chimney shall be carried up inside a ventilating duct unless such ducts are constructed as required by this article for metal chimneys; and only when such duct is used solely for venting the room or space in which the appliance served by the metal chimney is located. Metal chimneys shall not be installed in air supply ducts.

## **SECTION 1010.0 CHIMNEY CONNECTORS (SMOKEPIPES)**

The chimney connector from every heating appliance, except for vent connectors from gas-fired appliances, shall connect to a chimney conforming to the provisions of article 10.

**1010.1. Chimney Connectors.**—Chimney connectors shall be constructed of galvanized iron, or other approved noncombustible, corrosion-resistive materials having a melt point of not less than two thousand (2000) degrees F. No tile pipe shall be used as a chimney connector.

**1010.2. Thickness of Metal.**—The minimum thickness of metal for chimney connectors shall comply with the requirements of section 1019 for vent construction.

**1010.3. Length of Chimney Connector.**—All chimney connectors shall be as short and as straight as possible consistent with their use and the required draft conditions. No chimney connector shall pass through a floor or ceiling construction.

**1010.4. Chimney Connection.**—In entering a passageway in a masonry or metal chimney, the chimney connector shall be installed above the extreme bottom to avoid stoppage. Means shall be employed which will prevent the chimney connector from entering so far as to restrict the space between its end and the opposite wall of the chimney. The chimney connector shall be firmly attached or inserted into a thimble or slip joint to prevent it from falling out. All connections shall fit tightly. Chimney connections to any one passageway shall be limited to one floor, except as provided in section 1002.2.

**1010.5. Number of Chimney Connectors.**—Two (2) or more chimney connectors may be joined to a single connection provided that the chimney connectors are on one floor level and the passageway is of sufficient size to serve all of the appliances thus connected.

**1010.6. Chimney Connector Clearances.**

**1010.6.1. From Combustible Construction.**—Unless a chimney connector is covered on the exterior with at least one (1) inch of approved insulating noncombustible material, the following clearances shall be maintained from all combustible material or construction:

Diameter — Inches	Clearance — Inches
0-12.....	12
12-36.....	20
More than 36.....	36

**1010.6.2. Reduced Clearances.**—The clearances specified herein may be reduced one-half (1/2) when an approved metal or other approved noncombustible enclosing shell is installed so as to provide a continuous one (1) inch ventilated air space around the chimney connector with access openings for inspecting purposes; or the exposed combustible construction shall be protected with metal or other noncombustible materials as provided in section 1114. In no case shall the chimney connector of a medium or high heat appliance pass through any wall or partition of combustible construction.



**1010.7. Low Heat Chimney Connector Clearance.**—Chimney connectors from a low heat appliance may pass through combustible walls or partitions when protected at the point of passage by approved thimbles, fire-stopped with noncombustible material; or when such partition is constructed to afford a fire-resistance of not less than three-quarter ( $3/4$ ) hours for a distance corresponding to the required clearance in section 1010.6. with noncombustible materials.

**1010.8. Connections to Incinerator Chimney.**—The chimney connector of a heating appliance shall not be connected to the flue of an incinerator.

**1010.9. Masonry Flue.**—If a masonry flue connects a furnace with a chimney or a stack, it shall be lined and otherwise constructed as specified for a chimney.

## **SECTION 1011.0. VENT SYSTEMS**

For the purpose of determining vent requirements gas-fired and oil-fired appliances shall be classified as “listed” or “un-listed”. A listed appliance or accessory is one that is shown in a list published by an accredited authoritative testing agency, qualified and equipped for experimental testing of such appliances, and maintaining an adequate periodic inspection of current production of listed models and whose listing states either that the appliance or accessory complies with nationally recognized safety requirements or has been tested and found safe for use in a specific manner. Compliance may be determined by the presence on the appliance or accessory of a label of the testing agency stating that the appliance or accessory complies with nationally recognized safety requirements. An unlisted appliance or accessory is one that is not shown on such a list or does not bear such a label. In cases where no applicable standard has been developed for a given class of appliance or accessory, approval of the authority having jurisdiction should be obtained before the appliance or accessory is installed.

In any case of conflict between the requirements of sections 1011 and 1012 of this Code and the Massachusetts Code for Installation of Gas Appliances and Gas Piping the greater requirement shall control.

**1011.1. Appliances Required to be Vented.**—Appliances of the following types shall be connected to a listed venting system

or provided with other means for exhausting the flue gases to the outside atmosphere:

- a. Central heating appliances, including steam and hot water boilers, warm air furnaces, floor furnaces, and vented recessed heaters;
- b. Duct furnaces and self-contained unit heaters;
- c. Incinerators;
- d. Oil-fired water heaters and gas-fired water heaters with inputs over 5000 BTU per hour, except automatically controlled instantaneous water heaters which supply water to a single faucet which is attached to and made a part of the appliance;
- e. Built-in domestic cooking units listed and marked as vented units;
- f. Room heaters listed for vented use only;
- g. Appliances equipped with gas conversion burners;
- h. Appliances which have draft hoods supplied by the appliance manufacturer;
- i. Unlisted appliances, except as provided under section 1011.2.

**1011.2. Exemption.**—Connections to vent systems shall not be required for electric, gas and industrial appliances of such size or character that the absence of such connection does not constitute a hazard to the fire safety of the building or its occupants. The following appliances are not required to be vented:

- a. Listed gas ranges;
- b. Built-in domestic cooking units listed and marked as unvented units;
- c. Listed hot plates and listed laundry stoves;
- d. Listed domestic clothes dryers;
- e. Listed gas refrigerators;
- f. Counter appliances;
- g. Listed water heaters with inputs not over 5000 BTU per hour;
- h. Other appliances listed for unvented use and not provided with flue collars;
- i. Specialized equipment of limited input such as laboratory burners or gas lights;
- j. Electric water heaters.

When any or all of the appliances listed in items e, f, g and h above are installed so that the aggregate input rating exceeds thirty (30) BTU per hour per cubic foot of room or space in

which they are installed, one or more of them shall be vent connected or provided with approved means for exhausting the vent gases to the outside atmosphere so that the aggregate input rating of the remaining unvented appliance does not exceed thirty (30) BTU per hour per cubic foot of room or space in which they are installed. Where the room or space in which they are installed is directly connected to another room or space by a doorway, arch or other opening of comparable size, which cannot be closed, the volume of such adjacent room or space may be included in the calculations.

### **1011.3. Types of Gas Vents.**

**1011.3.1. Type B Gas Vents.**—Type B gas vents may be used to vent listed gas appliances except as provided in sections 1005.0, 1011.3.2 and 1012.6, and they shall be installed in accordance with their listings and the manufacturer's instructions.

**1011.3.2. Type B-W Vents.**—Type B-W gas vents shall be used with listed vented recessed heaters; and they shall be installed in accordance with their listings and the manufacturer's instructions.

**1011.3.3. Type C Vents.**—Type C gas vents may be used to vent listed gas appliances except as provided in section 1005.0, and shall be constructed of not less than No. 24 U.S. gage sheet copper, or No. 20 U.S. gage galvanized steel or of other equivalent strength and durability. Type C vents may pass directly through the roof or exterior wall to outer air; but shall not pass through any attic or other concealed space nor through any intermediate floor construction.

**1011.3.4. Type L Low-temperature Venting Systems.**—Type L low temperature venting systems shall be used only with fuel burning appliances listed as exhausting low-temperature flue gases and listed for use with Type L low-temperature venting systems. Type L low-temperature venting systems shall be installed in accordance with the terms of their listing and manufacturer's instructions.

**1011.3.5. Ventilating Hoods.**—Ventilating hoods and exhaust systems may be used to vent commercial appliances.

**1011.3.6. Chimneys.**—Chimneys shall be constructed in accordance with the requirements of article 10.

**1011.3.7. Existing Chimneys.**—Where an existing masonry chimney is unlined and where local experience indicates that vent gas condensate will be a problem, an approved liner or another vent shall be installed. Where inspection reveals that an existing chimney is not safe for the intended application it shall be

rebuilt to conform to the requirement of this code, or relined with a suitable liner or replaced with a gas vent or chimney suitable for the appliances to be attached.

**1011.3.8. Cleanouts.**—Cleanouts shall be of such construction that they will remain tightly closed when not in use. Tee fittings used as cleanouts or condensate drains shall have tight fitting caps to prevent entrance of air into the chimney or gas vent at that point.

**1011.3.9. Gas Appliances Connected to Chimneys.**—An automatically controlled gas appliance connected to a chimney which also serves equipment for the combustion of solid or liquid fuel shall be equipped with an automatic pilot. A gas appliance vent connector and a chimney connector from an appliance burning another fuel may be connected into the same chimney through separate openings, or may be connected through a single opening if joined by a suitable fitting located as close as practical to the chimney. If two (2) or more openings are provided into one (1) chimney they should be at different levels.

#### **1011.4. Installation Requirements.**

**1011.4.1. Size of Vents.**—The gas vent or chimney when connected to a single appliance shall not be less than the size of the draft hood outlet.

When more than one appliance is connected to a gas vent or chimney, the area shall be not less than the area of the largest vent connector plus fifty (50) percent of the areas of additional vent connectors.

In lieu of the above, the gas vent or chimney may be sized in accordance with section 1002.2.

Any shape gas vent may be used provided its venting capacity is equal to the capacity of round pipe for which it is substituted and the minimum internal dimension of the gas vent is not less than two (2) inches.

**1011.4.2. Gas Vent Termination.**—The gas vent or chimney shall extend high enough above the building or other neighboring obstruction so that wind from any direction will not create a positive pressure in the vicinity of the gas vent or chimney termination. Except as provided in section 1008.6.1, gas vents or chimneys shall extend at least two (2) feet above the highest point where they pass through a roof of a building and at least two (2) feet higher than any portion of a building within ten (10) feet; provided the following conditions are met:

- a. No gas vent or chimney shall terminate less than four (4) feet in vertical height above the highest connected appliance draft hood outlet or flue collar.
- b. No type B-W gas vent serving a vented recessed heater shall terminate less than twelve (12) feet in vertical height above the bottom of the heaters.

**1011.4.3. Exception.**—A listed gas vent equipped with a listed or approved top may be terminated below the peak of a pitched roof in accordance with the terms of the listing or approval.

**1011.4.4. Support of Gas Vents.**—All portions of gas vents and chimneys shall be adequately supported for weight and design of materials employed. Listed gas vents and factory-built chimneys shall be supported and spaced in accordance with their listings and manufacturer's instructions and sections 1007, 1008 and 1009.

**1011.4.5. Gas Vents Serving More than One Appliance.**—Where two (2) or more vent connectors enter a common vertical gas vent or chimney, the smaller connector should enter at the highest level consistent with available headroom or clearance to combustible material. Two (2) or more gas appliances may be vented through a common vent connector or manifold located at the highest level consistent with available headroom or clearance to combustible material. The manifold, all junction fitting, and the common vent connector shall be of size adequate for the combined volume of the vent gases.

**1011.4.6. Outside Vents.**—Outside gas vents and chimneys shall not be used in exposed locations except when permitted by the building official. When their use is permitted, the material shall possess high insulation qualities or be adequately insulated.

**1011.4.7. Condensate Drain.**—Where local experience with gas vent materials indicates that the condensate may be a problem, a capped tee and drainpipe shall be installed at the base of the riser to drain off condensate.

**1011.5. Prohibited Installations.**

**1011.5.1. Prohibited Termination.**—Natural draft vents extending through outside walls shall not terminate below eaves adjacent to such walls or parapets, but must be extended up at least two (2) feet above the eaves.

**1011.5.2. Unvented Room Heaters.**—Unvented room heaters are prohibited in accordance with Chapter 688 of the Acts of 1962 of the General Laws of the Commonwealth of Massachusetts.

## SECTION 1012.0. VENT CONNECTORS

**1012.1. Construction.**—Vent connectors used for conversion burners without draft hoods, incinerators and unlisted appliances shall be constructed of materials having resistance to corrosion and heat not less than that of No. 24 U.S. standard gage galvanized steel.

Vent connectors used for listed gas appliance having draft hoods and for listed conversion burners having draft hood, shall be constructed of listed type B gas vent material or materials having resistance to corrosion and heat not less than that of No. 26 U.S. standard gage galvanized steel.

**1012.2. Length and Pitch.**—The vent connector between the appliance and the vertical gas vent of chimney shall have the greatest possible initial rise consistent with the headroom available in the appliance area, and required clearance to combustible material. The horizontal run of the vent connector shall be as short as possible and the appliance shall be located as near the gas vent or chimney as practicable. The maximum length of an uninsulated horizontal run of connector shall not exceed seventy-five (75) percent of the height of the gas vent or chimney.

**1012.3. Clearances.**—Minimum clearances at vent connectors to combustible materials shall comply with applicable provisions of this section but shall not be less than listed in Table 10-1.

### 1012.3.1. Table 10-1.—

**Vent Connector Clearances for Gas Appliances**

Appliance	Minimum Distances From Combustible Materials	
	Listed Type B Gas Vent Material	Vent Connectors of Other Than Type B Materials
Listed Boiler .....	As listed	6 inches
Listed Warm Air Furnace .....	As listed	6 inches
Listed Water Heater .....	As listed	6 inches
Listed Room Heater .....	As listed	6 inches
Listed Floor Furnace .....	As listed	6 inches
Listed Incinerator .....	Not permitted	18 inches
Listed Conversion Burner (with draft hood) .....	6 inches	9 inches
Unlisted Appliances having draft hoods ...	6 inches	9 inches
Unlisted Appliances without draft hoods ..	Not permitted	18 inches

**1012.4. Reduced Clearances.**—The clearances specified in section 1012.3 may be reduced when the combustible construction is protected as provided in Table 10-2.

**1012.4.1. Table 10-2.—Reduced Clearances**

Type of Protection	Reduced Clearance
1/4 inch asbestos millboard with 1-inch noncombustible furring	6 inches reduced to 3 inches 9 inches reduced to 6 inches 18 inches reduced to 12 inches
No. 28 U.S. gage metal on 1/4 inch asbestos millboard spaced out with noncombustible spacers	6 inches reduced to 2 inches 9 inches reduced to 4 inches 18 inches reduced to 12 inches
No. 28 U.S. gage sheet metal spaced out 1-inch with non- combustible spacers	6 inches reduced to 2 inches 9 inches reduced to 4 inches 18 inches reduced to 9 inches

**1012.5. Size of Connectors.**—The vent connector shall not be smaller than the size of the flue collar or the draft hood outlet of the gas-fired equipment. Where the appliance has more than one (1) draft hood outlet, and in the absence of the manufacturer's specific instructions, the vent connector shall equal the combined area of the draft hood outlets for which it acts as a common connector to the gas vent or chimney. In lieu of the above, vent connectors may be sized in accordance with section 1002.2.

**1012.6. Labeling Gas Vents.**—Gas vent systems installed and approved for use with gas appliances, but which are not suitable for solid or liquid fuel-fired equipment shall be plainly and permanently labeled to that effect. They shall be plainly and permanently identified by a label reading:

“This gas vent is for appliances which burn gas only. Do not connect to incinerator or solid or liquid fuel burning appliance.”

This label shall be attached to the wall or ceiling at a point near where the gas vent system enters the wall, ceiling or chimney.

**1012.7. Special Venting Arrangements.**

**1012.7.1. Appliances with Sealed Combustion Chambers.**—The provisions of draft hoods as required by section 1011.3. apply to listed appliances having sealed combustion chambers and which are so constructed and installed that all air for combustion is derived from outside the space being heated and all flue gases are discharged to the outside atmosphere. Such appliances, having integral venting, shall be considered as being properly

vented when they are installed in accordance with their listings and the manufacturer's instructions.

**1012.7.2. Gas Vent and Chimney Exhausters.**—Gas vent and chimney exhausters may be used with gas appliances in lieu of natural draft vents, except for incinerators. Where an exhauster is used with gas appliances requiring venting, provisions shall be made to prevent the flow of gas to the main burner in the event of failure of the exhaust system. A vent connector serving a gas appliance vented by natural draft shall not be connected into the discharge side of a power exhauster.

**1012.7.3. Ventilating Hoods and Exhaust Systems.**—Ventilating hoods and exhaust systems may be used to vent gas appliances installed in commercial applications. When automatically operated appliances, such as water heaters, are vented through natural draft ventilating hoods, dampers shall not be installed in the ventilating system. When the ventilating hood or exhaust system is equipped with power means of exhaust, the appliance control system shall be so interlocked as to permit appliance operation only when the power means of exhaust is in operation. When required or used, ventilating hoods shall be built and installed in accordance with section 1127.1.

## **SECTION 1013.0. FIREPLACES**

**1013.1. Construction.**—Separate flues shall be provided for every fireplace. Fireplace chimneys shall meet the requirements of Article 10 for low temperature chimneys. Fireplaces shall be supported on concrete or masonry bases. Piers built integrally with fireplaces to support wood construction may be used provided the wood is separated from the fireplace masonry by at least a two (2) inch air space, except that the air space may be three-fourths ( $3/4$ ) of an inch when the thickness of solid masonry between the smoke chamber and the face of the fireplace is at least eight (8) inches.

**1013.1.1. Backs and Jambs.**—Masonry fireplaces shall have backs and jambs of solid masonry or concrete with a total thickness not less than eight (8) inches including lining. Lining shall be two (2) inch thick firebrick, two (2) inch thick soapstone, three-sixteenth ( $3/16$ ) inch thick steel or cast iron, or equivalent material capable of withstanding a temperature of 2000° F. without cracking or spalling. Where no lining is provided the thickness of backs and jambs shall be twelve (12) inches.



**1013.1.2. Integral Heaters.**—Where approved factory-built fireplace units equipped with warm air circulating chambers are installed integrally with the fireplace construction, the back and jambs may be four (4) inches thick, provided the unit is installed in accordance with the conditions of the approval.

**1013.2. Hearths.**—Every fireplace shall be constructed with a hearth of brick, stone, tile, or equivalent noncombustible material. For fireplaces with an opening of less than six (6) square feet the hearth shall extend at least sixteen (16) inches in front and eight (8) inches beyond each side of the fireplace opening. For fireplaces with an opening of six (6) square feet or more the hearth shall extend at least twenty (20) inches in front and twelve (12) inches beyond each side of the fireplace opening. Such hearths shall be supported on trimmer arches of brick, stone, tile or concrete at least four (4) inches thick, or other equivalent materials. Where a fireplace is elevated above or overhangs a floor, the hearth extension shall also extend over the area under the fireplace. The outer hearth for factory-built fireplaces shall be of noncombustible material at least three-eighths ( $3/8$ ) inch thick, and may be placed upon a combustible subfloor or finish floor if easily distinguishable from the adjacent floor. All combustible forms or centering shall be removed after completion of the supporting construction.

**1013.3. Fireplace Damper.**—Every fireplace shall be equipped with an approved damper, except as provided for vent flues from gas-fired appliances in section 1012.7.

**1013.4. Fireplace Clearances.**

**1013.4.1. Floor Framing.**—All header and trimmer beams of combustible floor construction shall be located at least four (4) inches from the face of chimneys and backs of fireplaces and the spaces shall be fire-stopped with approved noncombustible materials, except in one- and two-family dwellings where a minimum of two (2) inches clearance must be maintained.

**1013.4.2. Combustible Trim.**—Wood or other combustible material shall not be installed on or about a fireplace less than six (6) inches from the fireplace opening, and combustible materials located within twelve (12) inches above the opening shall not project more than one-eighth ( $1/8$ ) inch from the face of the masonry for each one (1) inch distance above the opening.

**1013.5. Fireplace Heaters.**—No heater shall be placed in a fireplace unless it conforms to the requirements of article 11 for such device and is provided with a flue; except an electric

or gas-fired heater which is exempted from vent requirements under the provisions of section 1011.

**1013.6. Imitation Fireplaces.**—The depth of an imitation fireplace or recess for heating equipment shall be not more than six (6) inches, unless such recess meets all the construction requirements for fireplaces. The surfaces of the recess shall be of masonry or fire-resistive plaster and all combustible materials shall have the clearances or shall be fire-protected as specified herein. No flue other than an approved gas vent shall be installed within such imitation fireplaces.

**1013.7. Hoods.**—Metal hoods used as part of a fireplace shall be not less than No. 18 galvanized sheet gage, 24 oz. per square foot copper, or other equivalent corrosion-resistant ferrous metal with all seams and connections of smokeproof unsoldered construction. The hoods shall be sloped an angle of forty-five (45) degrees or less from the vertical and shall extend horizontally at least six (6) inches beyond the limits of the firebox. Metal hoods shall be kept a minimum of eighteen (18) inches from combustible materials unless approved for reduced clearances.

**1013.8. Factory-built Fireplaces.**—Approved factory-built fireplaces shall be exempt from the foregoing provisions provided they are installed in accordance with the conditions of approval.

**1013.9. Barbecues.**—Barbecues or grilles that employ an open flame for roasting or broiling and that are located in the interior of buildings, or on the exterior of buildings when against any part of an exterior wall, shall comply with all of the foregoing provisions for construction of fireplaces.

## **SECTION 1014.0. CUPOLA CHIMNEYS**

**1014.1. Height of Cupolas.**—A chimney or a metal smokestack for a cupola furnace, blast furnace or similar high heat industrial device shall extend not less than twenty-five (25) feet above any roof within a radius of fifty (50) feet and shall be covered on the top with replaceable heavy wire netting or other spark arrestor as provided in section 1020. This spark arrestor must be maintained effective at all times.

**1014.2. Cupola Clearances.**—No combustible material shall be erected or placed within three (3) feet of any cupola or other high temperature chimney.

**SECTION 1015.0. INCINERATOR CHARGING CHUTES**

**1015.1. Directly Connected.**—When directly connected to the combustion chamber of the incinerator, the chutes shall be gas tight with smooth linings and shall conform to the following:

- a. They shall be constructed in accordance with the requirements for medium temperature chimneys.
- b. They shall extend through the building roof and be open to the outer air, capped with a motorized purge damper. The opening shall be equal to the required chute size at the top floor.
- c. The purge damper shall be constructed to open automatically under conditions of excessive pressure or temperature.
- d. Provisions shall be made for sanitizing the charging chute by heating or purging at a temperature of at least four hundred (400) degrees F but not higher than one thousand (1000) degrees F.

**1015.2. Not Directly Connected.**—When not directly connected to the building service incinerator, the chutes shall be gas tight with smooth linings and shall conform to the following:

- a. They shall be constructed in accordance with the applicable requirements for shafts in table 2-1 and article 9.
- b. They shall extend through the building roof and be open to the air. The opening shall be equal to at least one (1) square foot and shall be provided with a spark arrestor in accordance with section 1020.0.
- c. If a roof damper is used it shall be constructed to open automatically under conditions of excessive pressure or temperature.
- d. Automatic sprinkler heads shall be provided in the chute as required by article 12, and shall be installed so as not to obstruct the passage of refuse.
- e. Provisions shall be made for sanitizing the chute by spraying, washing, or other equivalent means.
- f. Bins, containers, or rooms for receiving rubbish shall be constructed as required by article 11 and sprinklers shall be provided as required by article 12.

**1015.3. Sizes.**—Chutes not directly connected to the incinerator shall have a cross-sectional free area adequate for the service intended. Chutes directly connected to the incinerator shall have minimum sizes as provided in table 10-3.

**1015.3.1. Table 10-3. —**

**Minimum Size of Charging Chutes**

<b>Building Height</b>	<b>Location</b>	<b>If Square</b>	<b>If Round</b>
7 stories or less	All 7 stories	22½'' x 22½''	24'' dia.
8 to 30 stories	Top 7 stories	22½'' x 22½''	24'' dia.
	8th to 30th from the top	27'' x 27''	30'' dia.
31 stories and over	Top 7 stories	22½'' x 22½''	24'' dia.
	8th to 30th from the top	27'' x 27''	30'' dia.
	Remaining lower	32'' x 32''	36'' dia.

**1015.4. Charging Doors.**—Charging doors, service openings, or hopper doors for chutes shall be located in separate rooms or compartments enclosed in walls or partitions, floors, and ceilings having a fireresistance rating of at least one (1) hour. Such openings, shall, in no case, have a free area of more than one-third (1/3) of the cross-sectional free area of the chute to which they give access. All such openings shall be substantially constructed of steel or the equivalent metal of sufficient thickness to prevent distortion or other damage in normal usage. The door shall be provided with counter-weights, door checks, or other equivalent means for automatically closing after use. No part of the door shall project into the chute at any time. The minimum height of charging doors openings shall be eleven (11) inches, and the minimum width shall be thirteen (13) inches.

**SECTION 1016.0. INCINERATOR CHIMNEYS**

**1016.1. Chimneys for Building Service Incinerators.**—Chimneys for building service incinerators shall be constructed in accordance with the requirements of this article for high or medium temperature chimneys, based upon the temperature of the flue gases leaving the equipment, except that no reduction of flue gas temperature shall be recognized if such reduction is the result of using water scrubbers or barometric dampers. In addition, such chimneys shall comply with the following:

- a. Chimneys shall extend through the roof and be open to the air.
- b. Chimneys shall be provided with a spark arrestor as required in section 1020.
- c. Incinerators may discharge into chimneys serving other equipment provided such combined chimney is of ade-

quate size for both uses, conforms to construction required for the highest temperature, and adequate draft control equipment is provided for each device connected to the combined chimney.

### **1016.2. Chimneys for Industrial or Municipal Incinerator Plants.**

—Chimneys for central incinerator plants shall be constructed in accordance with the requirements for:

- a. Medium temperature chimneys if the incinerator is provided with a heat recovery unit or other means to assure a flue gas temperature not in excess of 1000° F at the base of the stack.
- b. High temperature chimneys if the incinerator has no heat recovery unit or other means to assure a flue gas temperature less than 1000° F.

## **SECTION 1017.0. INCINERATOR CHIMNEY CONNECTORS**

**1017.1. Incinerator Chimney Connectors.**—Chimney connectors from the combustion chamber of an auxiliary fuel-fired incinerator shall be constructed of metal at least as heavy as No. 16 manufacturers standard gage when twelve (12) inches or less in diameter or greater dimension, and of metal at least as heavy as No. 12 manufacturers standard gage when they exceed twelve (12) inches in diameter or greater dimension.

**1017.2. Lining.**—Chimney connectors from auxiliary fuel-fired incinerators shall be lined with firebrick, laid in fire clay mortar, at least two and one-half (2-1/2) inches thick when they are between twelve (12) inches and eighteen (18) inches in diameter or greater dimension and at least four and one-half (4-1/2) inches thick when they are larger; where no flue gas temperature reduction is effected the chimney connectors shall be equipped with a guillotine or horizontal sliding damper or butterfly damper. If chimney connectors from auxiliary fuel-fired incinerators lead into and combine with chimney connectors from other equipment, the connectors from the other equipment shall also be lined as required for direct flue connections unless the cross-sectional area of the connector into which they lead is at least four (4) times their required cross-sectional area.

**1017.3. Area.**—Chimney connectors for an auxiliary fuel-fired incinerator to a boiler stack or chimney for a high temperature heating equipment shall be permitted when the cross-sectional

area of such stack or chimney is at least four (4) times that of the incinerator chimney connector.

**1017.4. Clearance.**—The clearance of incinerator chimney connectors from combustible material or construction shall be at least thirty-six (36) inches. This clearance may be reduced as provided in section 1010.6 in accordance with the type of protection applied to the combustible material or construction.

## **SECTION 1018.0. DUCT AND PIPE SHAFTS**

In all buildings other than one- and two-family dwellings, vertical ducts or pipes arranged in groups of two or more which extend through two (2) or more stories and occupy an area of more than one (1) square foot shall be enclosed in construction of not less than three-quarter (3/4) hour fire-resistance to comply with section 911.

## **SECTION 1019.0. CONSTRUCTION OF METAL DUCTS AND VENTS**

All metal vents, ducts and duct systems required under the provisions of articles 10 and 11 for heating systems and equipment, and under the provisions of articles 5 and 18 for ventilating and air-conditioning systems shall be constructed and installed in accordance with the requirements of this Code and accepted engineering practice.

**1019.1. Material.**—Ducts and vents shall be constructed of aluminum, copper, monel metal, galvanized steel, cement-asbestos or other approved, noncombustible, corrosion-resistive materials of adequate strength, durability and for the temperatures involved; and the seams shall be securely welded or riveted and made substantially air and gas tight.

**1019.2. Thickness of Metal.**—The weight and thickness of material, type of joints, connections, bracing and other structural features shall conform to the approved rules; but shall be at least equivalent to the minimum thickness prescribed in table 10-4. Aluminum shall be of not less than No. 26 B&S gage, copper of not less than 16 ounce sheets, galvanized iron and monel metal of not less than No. 28 U.S. gage, except as provided for one- and two-family dwellings in table 10-5.

**1019.2.1. Table 10-4.—****Metal Duct and Vent Construction Other Than Dwellings****Minimum Thickness**

Diameter, or Diagonal of Rectangular Ducts, Dimension in Inches	Minimum Thickness	
	Galvanized Steel U.S. Gage Number	Aluminum B & S Gage Number
Up to 12.....	28	26
12-20.....	26	24
20-30.....	24	22
30-48.....	22	20
48-60.....	20	18
60-90.....	18	16
90 and over .....	16	14

**1019.3. One- and two-Family Dwellings.**

**1019.3.1. Material.**—Warm air supply ducts in heating and air-conditioning systems of one- and two-family dwellings shall be constructed of aluminum, copper, galvanized steel, as specified in table 10-5 or other approved noncombustible materials of equal strength and durability.

**1019.3.2. Table 10-5.—****Ducts for Dwellings****Minimum Thickness and Weight**

Diameter, or Diagonal of Rectangular Ducts, Dimensions in Inches	Minimum Thickness and Weight		
	Tin Weight Per Square in Pounds	Galvanized Steel U.S. Gage Number	Aluminum B & S Gage Number
Up to 12.....	IC 107	30	26
12-18.....	IX 135	28	26
18 and over .....	IX 135	26	24

**1019.3.3. Supports.**—All ducts shall be securely supported by metal or other approved noncombustible straps, hangers, lugs and brackets.

**1019.3.4. Clearances.**—Horizontal runs of such ducts shall be located not less than one (1) inch from adjacent combustible construction unless insulated or protected as required in section 1019.4; and ducts in vertical partitions or concealed ceiling spaces shall be insulated in all cases with not less than twelve (12) pound asbestos paper with five-sixteenths (5/16) inch intermediate air space or protected with one-quarter (1/4) inch air-cell asbestos or equivalent.

## **1019.4. High Temperature Ducts.**

**1019.4.1. Construction.**—A single metal duct for a high temperature system which is enclosed in a combustible partition, or in a concealed ceiling space shall be of double construction with a continuous intervening air space of not less than one (1) inch; or the duct shall be covered on the exterior with approved noncombustible, insulating materials not less than one-fourth ( $1/4$ ) inch thick of air-cell asbestos or its equivalent. Approved asbestos cement ducts, not less than one-quarter ( $1/4$ ) inch thick, shall be insulated by an air space of not less than one-eighth ( $1/8$ ) inch. When not insulated, clearances shall comply with section 1010.

**1019.4.2. Exception.**—When sufficiently insulated to prevent more than two hundred and fifty (250) degrees F. temperature on the exterior, the clearances herein specified shall not be required.

**1019.5. Duct Lining.**—The lining of high temperature ducts shall be of approved noncombustible materials.

**1019.6. Cold Air Ducts.**—The construction of cold air ducts shall comply with all the provisions governing warm air supply ducts except as to heat insulation.

**1019.7. Fire-stopping.**—Whenever the passage of ducts in walls, floors or partitions requires the removal of fire-stopping, the surrounding spaces shall be completely filled with approved noncombustible materials; and the required clearance shall be maintained by a metal thimble which is filled with approved noncombustible insulating materials, or closed at both ends with metal collars.

**1019.8. Ducts from Warm Air Furnaces.**—The clearances of a metal duct from combustible materials for a distance of six (6) feet from warm air furnaces shall comply with section 1114. A duct which enters a floor, wall or partition of combustible construction within six (6) feet from the furnace shall change direction through an angle of ninety (90) degrees or more before it enters such floor, wall or shaft and shall be enclosed with approved fireresistive assemblies as required in section 1018 for duct shafts.



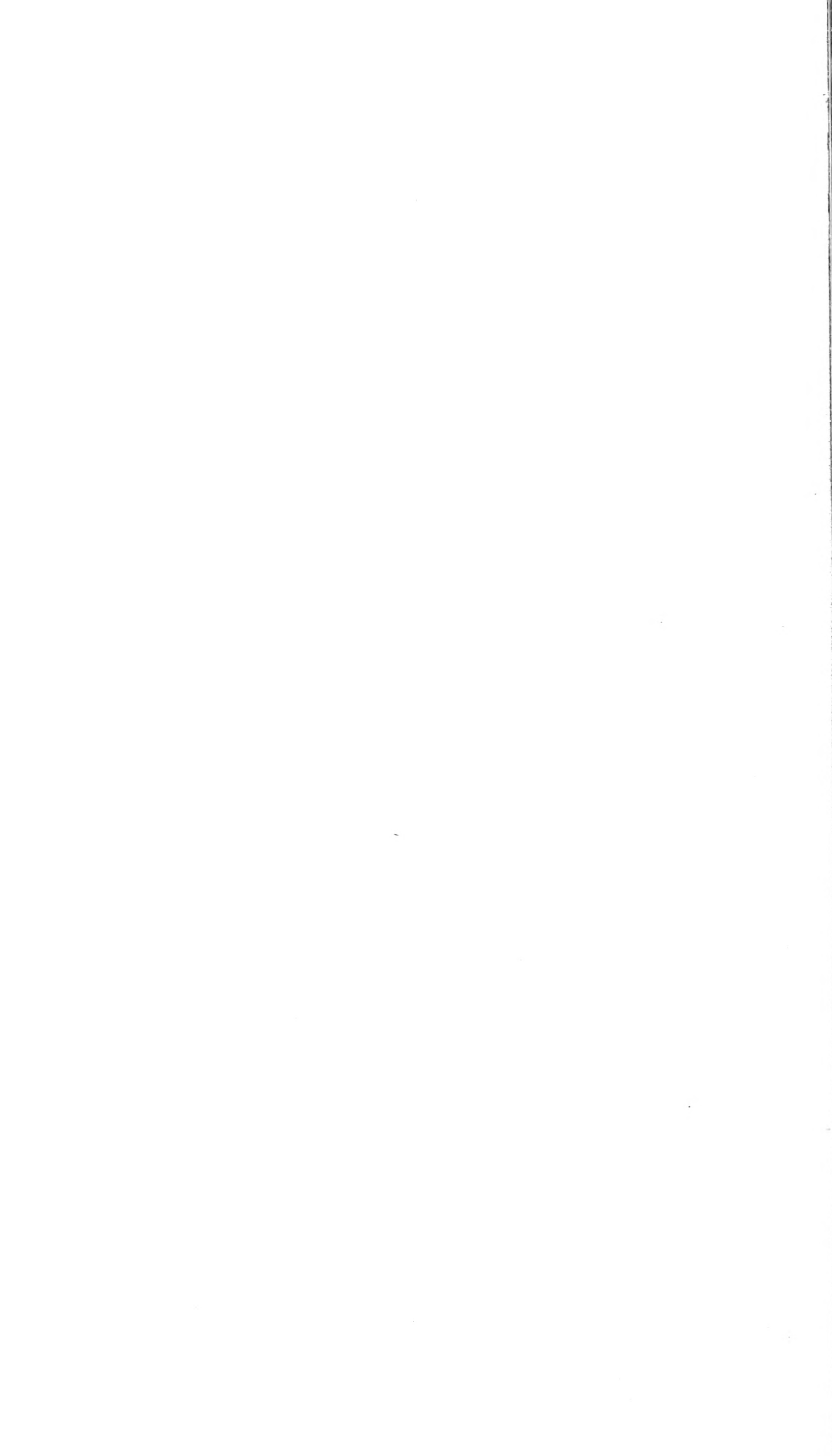
## **SECTION 1020.0. SPARK ARRESTORS**

All chimneys, stacks and flues including incinerator stacks, which emit sparks that create a fire hazard, shall be provided with a spark arrestor of approved noncombustible construction in which the maximum size of mesh shall not exceed three-quarters (3/4) inch. The total area of spark arrestors shall be not less than four (4) times the flue area. Unless the arrestor is of ceramic material it shall be constructed in a readily replaceable form and shall be maintained effective at all times.

## **SECTION 1021.0. EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES**

**1021.1. Exhaust Pipe Construction.**—The exhaust pipe from internal combustion engines shall be constructed in accordance with the requirements for metal chimneys based on the temperature of the gases entering the exhaust pipe, provided that the requirements for at least a medium temperature chimney shall apply. The exhaust pipe shall be constructed of at least three-sixteenth (3/16) inch steel, or of other equivalent metal of similar strength and resistance to the temperature and corrosive action of the exhaust gases, and no lining shall be required. Where the exhaust pipe runs inside a building, it shall be insulated with an insulation adequate for the temperature of the pipe, so that the surface temperature shall be not more than two hundred (200) degrees F. All joints shall be constructed so as to be gas tight under all operating conditions. No threaded joints shall be permitted in pipe sizes over four (4) inches or in pipe thickness less than that of schedule forty (40) steel pipe.

**1021.2. Location of Discharge Opening.**—The location of the discharge opening of the exhaust pipe shall comply with the requirements of section 1003.1 and, in addition, the opening shall be located or arranged so that it cannot cause condensate leaving the outlet to come in contact with people. The exhaust pipe may be connected to a chimney used for other equipment, provided that the operation of the engine does not adversely affect the operation of the other equipment so as to cause a fire or pollution hazard.



## CHIMNEYS, FLUES AND VENT PIPES

### List of Reference Standards

- RS 10**    ANSI    A62.4    1947  
SIZES OF FLUE LININGS
- ANSI    Z21.12    1937  
LISTING REQUIREMENTS FOR DRAFT HOODS
- ASTM    C106    1967  
FIRECLAY, BRICK & SILICON CARBIDE BRICK FOR INCINERATOR SERVICE, SPEC. FOR (REFRATORIES FOR INCINERATORS)
- ASTM    C178    1947  
AIR-SETTING REFRACTORY MORTAR FOR BOILER & INCINERATOR SERVICES SPEC. FOR
- ASTM    C270    1968  
MORTAR FOR UNIT MASONRY, SPEC. FOR
- ASTM    C279    1954  
CHEMICAL-RESISTANT MASONRY UNITS, SPEC. FOR
- ASTM    C315    1956  
CLAY FLUE LININGS, SPEC. FOR
- ASTM    C401    1968  
CASTABLE REFRACTORIES, STD. CLASSIFICATION OF
- U.L.    103    1964  
FACTORY-BUILT CHIMNEYS
- U.L.    441    1964 (rev. 1966)  
GAS VENTS, STANDARD FOR
- U.L.    641    1965  
TESTING STANDARDS FOR LOW-TEMPERATURE (VENTING SYSTEM) TYPE L



## HEATING EQUIPMENT AND APPLIANCES— MOUNTING, CLEARANCES AND CONNECTIONS

1100.0	Scope	1120.0	Warm Air Heating Systems
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1102.0	Plans and Specifications	1122.0	Flammable Vapor Systems
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1109.0	Mounting Exceptions for Heat Appliances	1129.0	Gas-Fired Equipment
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1114.0	Clearance Exceptions	1134.0	Drying Rooms
1115.0	Boiler Rooms	1135.0	Incinerators
1116.0	Ash Pits and Bins	1136.0	Omitted
1117.0	Steam and Hot Water Pipes	1137.0	Omitted
1118.0	Heating Panels	1138.0	Refuse Chutes
1119.0	Hot and Cold Air Ducts	1139.0	Refuse Vaults
		1140.0	Blower and Exhaust Systems
		1141.0	Dust, Stock and Refuse Conveyor Systems
		RS 11	Reference Standards

### TABLES

11-1	1114.1.1	Heating Appliance Clearance Variations
11-2	1114.3.1	Reduced Wall and Ceiling Clearances
11-3	1140.1.1	Thickness of Steel Sheet Exhaust Ducts
11-4	1140.1.2	Clearance of Exhaust Ducts

### SECTION 1100.0. SCOPE

The provisions of this article shall control the construction, inspection and maintenance of all heating, blower and exhaust systems in all buildings and structures in respect to structural strength, fire safety and operation.

**1100.1. Accepted Engineering Practice.**—All such systems and equipment constructed, installed and maintained in accordance with the applicable standards listed in Reference Standard RS-11 shall be deemed to conform to the provisions of this Code.

**1100.1.1. Standard Code Adopted.**—All installations of gas appliances must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under G.L., Chap. 737, Acts of 1960. Attention is also called to FPR-3, RULES AND REGULATIONS made in accordance with the provisions of G.L., Ch. 148, Section 10, as amended, governing the construction, installation and operation of OIL BURNING EQUIPMENT. In case of possible conflict the greater requirement shall control.

**1100.1.2. Boiler Rules and Regulations.**—Attention is directed to the rules and regulations issued by the Board of Boiler Rules under the authority of Chapter 146 of the General Laws of the Commonwealth of Massachusetts governing the construction, installation, testing, and inspection of boilers, air tanks, ammonia compressor safety valves, and refrigeration and air conditioning systems of five tons or more capacity. In case of possible conflict, the greater requirement shall control.

**1100.2. Cooperating Agencies.**—Nothing herein contained shall be deemed to nullify the provisions of other legal statutes or regulations of the municipality or state governing the operation and maintenance of boilers and other heating appliances and equipment nor the acceptance of the certificates and labels of inspection by Underwriters Laboratories, Inc., the American Gas Association or other accredited testing authorities and contained in the published lists of such nationally recognized agencies.

**1100.3. Labeled Heating and Cooking Appliances.**—Approved gas and oil-fired warm air furnaces, floor furnaces, unit heaters, domestic incinerators, cooking and heating stoves and ranges and other heating equipment, inspected and approved by the Underwriters Laboratories, Inc., the American Gas Association or other accredited testing authorities and contained in the published listings of such nationally recognized agencies may be accepted by the building official when installed with the reduced clearances and details of installation therein recommended, provided they meet the requirements of this Code for fire protection.

**1100.4. General Requirements.**—All heating, combustion, and cooking equipment shall be installed with adequate clearances from combustible construction in accordance with the provisions of this article. Either the equipment shall be provided with insulation or the building construction shall be fire protected, so that during continued or intermittent operation the surface of

combustible construction materials will not be raised to a temperature higher than 180 degrees F. Such equipment shall be located, arranged, and protected so that the means of access to them for ordinary operation and maintenance will not be hazardous. They shall not be located in exits, closets, hoistways, nor in the same space with other equipment or materials when the proximity to the other equipment or materials would create a hazardous condition. All piping shall be installed so as to provide for adequate expansion and contraction.

## **SECTION 1101.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see Article 2.

## **SECTION 1102.0. PLANS AND SPECIFICATIONS**

Plans and specifications for the installation, repair, extension or removal of any heating appliance herein defined or of a heating, blower or exhaust system shall be submitted to the building official and a permit shall be secured prior to the commencement of any installation, except as herein provided.

**1102.1. Matter Covered.**—The plans and specifications shall show in sufficient detail all pertinent features and clearances of the appliances and systems including size and type of apparatus, construction of flue, stack or chimney, stack connections, kind of fuel, method of operation and the method of preventing the emission with the products of combustion of solids and gases detrimental to health.

**1102.2. Permit.**—Upon approval of the plans, a permit shall be secured from the building official before any work is started on the installation; and the permit or a copy thereof shall be posted at the site at all times during the course of installation.

**1102.3. Exemption from Permit.**—A heating appliance permit is not required for the installation, alteration, extension or removal of a solid fuel-fired warm-air space heating furnace not connected to duct work, nor for any heating appliance which does not require venting.

## **SECTION 1103.0. OMITTED**

## **SECTION 1104.0. SMOKE ABATEMENT**

All furnaces and heating appliances fired with solid, liquid or gas fuels which are subject to the provisions of section 1102, including all rubbish burners and incinerators, shall be so designed that they will not discharge under normal conditions of operation excessive smoke, soot, cinders, fly-ash or other materials which are deleterious to the safety or health of the public.

Attention is called to Rules and Regulations to **Prevent Pollution or Undue Contamination of the Atmosphere within the Metropolitan Air Pollution Control District** issued by the Commonwealth of Massachusetts Department of Public Health under the authority of Section 142B, Chapter 111, of the General Laws of the Commonwealth. These rules may, in certain instances require approval by the Department of Public Health.

## **SECTION 1105.0. OMITTED**

## **SECTION 1106.0. EXISTING BUILDINGS**

**1106.1. Unsafe Operation.**—All existing heating appliances and equipment shall be maintained and operated in accordance with the requirements of this Code. Any such equipment which does not comply with the requirements and the operation of which is deemed unsafe to the building occupants shall be altered as ordered by the building official to secure adequate safety.

**1106.2. Minor Heating Repairs.**—Minor repairs which do not increase the capacity of heating apparatus or appliances, or which do not involve any substantial alteration in the method of operation or means of smoke prevention may be made without a permit.

## **SECTION 1107.0. INDUSTRIAL HEATING APPLIANCE CLASSIFICATION**

**1107.1. Low Heat Appliances.**—A steam boiler which operates at fifty (50) pounds per square inch or less gage pressure; or a steam boiler of less than ten (10) boiler horsepower, regardless of operating pressure; or any equipment otherwise classified as



a medium heat appliance, but not larger than one hundred (100) cubic feet in size, in which the products of combustion at the point of entrance to the flue under normal operating conditions have a temperature of six hundred (600) degrees F. or less shall be classified as a low heat appliance.

Low heat appliances shall include among others:

Baking Ovens	Forge Furnaces (Solid Fuel-fired)
Candy Furnaces	Gypsum Kilns
Coffee Ovens	Lead Melting Furnaces
Core Ovens	Paraffine Furnaces
Fertilizer Ovens	Resin Melting Furnaces
	Zinc Amalgamating Furnaces

**1107.2. Medium Heat Appliances.**—A steam boiler which operates at fifty (50) pounds or more per square inch gage pressure; or a steam boiler of over ten (10) boiler horsepower regardless of operating pressure, or any heat appliance, in which the products of combustion at the point of entrance to the flue have a temperature of between six hundred (600) degrees and one thousand (1000) degrees F. under normal operating conditions shall be classified as a medium heat appliance.

Medium heat appliances shall include among others:

Alabaster Gypsum Kilns	Gas Producers
Annealing Furnaces	Hardening Furnaces
Charcoal Furnaces	Lime Kilns
Feed Dryers (direct fired)	Linseed Oil Boiling
Fertilizer Dryers (direct fired)	Pulp Dryers (direct fired)
Galvanizing Furnaces	Wood Distilling Furnaces
	Wood Gas Retorts

**1107.3. High Heat Appliances.**—Any appliance rated at higher horsepower or operating at higher temperatures or pressures than a low or medium heat appliance shall be classified as a high heat appliance.

High heat appliances shall include among others:

Bessemer Retorts  
Blast, Billet and Bloom and  
Open Hearth Furnaces  
Brass Furnaces  
Cement, Brick and Tile  
Kilns  
Coal and Water Gas  
Retorts

Cupolas  
Glass Kilns and Furnaces  
Porcelain Baking and Glazing  
Kilns  
Reverberatory Furnaces  
Welding Furnaces  
Wood Carbonizing Furnaces

## **SECTION 1108.0. HEAT APPLIANCE FOUNDATION MOUNTINGS**

Unless specifically exempted in section 1109, all floor-mounted industrial heat appliances shall be mounted on the ground, or on a foundation of the following specified fireresistive construction with the required noncombustible insulated flooring or finish. No combustible material shall be permitted against the underside of the appliance or under the foundation unless specifically exempted. Such construction and insulation shall extend not less than the specified distances from the sides of the appliance. The fireresistive floor and its finish shall have equal heat insulation value as the protection herein required or such protection shall cover the entire surface under the appliance. The installation of heating appliances which operate at higher temperatures or pressures and industrial power or process boilers and furnaces shall be governed by accepted engineering practice.

**1108.1. Low Heat Appliances.**—Under a low heat appliance, the floor shall be of masonry or other noncombustible construction which affords not less than two (2) hour fireresistance and shall extend not less than twelve (12) inches beyond the appliance on all sides. When solid fuel is used, the floor on the firing side or where ashes are removed shall be protected for at least eighteen (18) inches with not less than one-quarter (1/4) inch asbestos, lumber covered with No. 24 U.S. gage sheet metal, or its approved equivalent.

**1108.2. Medium Heat Appliances.**—Under a medium heat appliance, the floor shall be of masonry or other noncombustible construction which affords not less than three (3) hours fire-resistance and shall extend not less than three (3) feet beyond the appliance on all sides. When solid fuel is used, the fire-resistive floor shall extend not less than eight (8) feet at the front or side from which the appliance is fired or the ashes are

removed and shall be protected with not less than No. 24 U.S. gage sheet metal.

**1108.3. High Heat Appliances.**—Under a high heat appliance, the floor shall be of masonry or other noncombustible construction which affords not less than four (4) hours fire resistance and shall extend not less than ten (10) feet beyond the appliance and not less than thirty (30) feet at the front or side where hot products are removed and shall be protected with not less than No. 24 U.S. gage sheet metal.

**1108.4. Insulation.**—Heat appliances mounted on floors required to be waterproofed shall have insulation sufficient to protect the waterproofing against damage from heat.

## **SECTION 1109.0. MOUNTING EXCEPTIONS FOR HEAT APPLIANCES**

When heat appliances are approved for installation on combustible construction they shall be mounted in accordance with the conditions of the approval and within the limitations of this section.

**1109.1. Twenty-Four Inch Clearance.**—When medium heat appliances are mounted on legs which provide an open ventilated space of not less than twenty-four (24) inches in height under the base and the appliance is arranged to prevent flame or hot gases from coming into contact with the base, the supporting floor shall be protected with four (4) inches of hollow clay or concrete tile covered with sheet metal of not less than twenty-four (24) U.S. gage. The masonry tile course shall be laid with ends unsealed and joints matched so as to provide through circulation of air.

**1109.2. Eighteen Inch Clearance.**—When low heat appliances are mounted on legs which provide an open ventilated space of not less than eighteen (18) inches in height under the base, and one or more metal baffles are furnished between the burners and the floor and the appliance is arranged to prevent flame or hot gases from coming in contact with the base, the supporting floor shall be insulated with not less than one-quarter (1/4) inch asbestos mill board covered with No. 24 U.S. gage steel sheets under the appliance, projecting not less than eighteen (18) inches from the sides of the appliance where fired and where hot products of combustion are removed.

**1109.3. Eight Inch Clearance.**—When low heat appliances are mounted on legs which provide an open ventilated space of eight (8) inches in height under the base, and the appliance is arranged to prevent flame or hot gases from coming into contact with the base, the supporting floor shall be protected with not less than three-eighth ( $3/8$ ) inch asbestos mill board covered with not less than No. 24 U.S. gage sheet metal; and said protection shall project at least six (6) inches beyond all sides of the appliance and eighteen (18) inches therefrom on firing sides and where hot products of combustion are removed.

**1109.4. Four Inch Clearance.**—When low heat appliances are mounted on legs which provide an open ventilated space of not less than four (4) inches in height under the base, and the appliance is so arranged as to prevent the flame or hot gases from coming in contact with the base, the supporting floor shall be protected with four (4) inches of hollow clay or concrete tile covered with sheet metal of not less than No. 24 U.S. gage. The masonry tile course shall be laid as provided in section 1109.1.

**1109.5. Double Tile Base Protection.**—When low heat appliances are not mounted on legs, the supporting floor shall be protected with two (2) courses of four (4) inch hollow clay or concrete tile covered with a three-sixteenth ( $3/16$ ) inch steel plate. The tile courses shall be laid at right angles to each other, with the ends unsealed and joints matched in such manner as to provide a free circulation of air through the hollow masonry. On the firing side or where hot products of combustion are removed, the mounting and protection shall extend not less than eighteen (18) inches from the side of the appliance.

**1109.6. Water-Cooled Base.**—A low heat boiler with a water-cooled base, which has a grate area of less than three (3) square feet or one in which the combustion chamber is located not less than twelve (12) inches above the floor, may rest directly on a sheet metal base of not less than No. 14 U.S. gage steel without heat insulation on combustible construction.

## **SECTION 1110.0. MOUNTING EXCEPTIONS FOR HOUSE HEATING APPLIANCES**

Boilers and furnaces used for heating buildings and structures including low pressure steam and hot water boilers, warm air

furnaces and floor mounted direct-fired unit heaters shall be installed in accordance with accepted engineering standards listed in Reference Standard RS-11 within the limitations of this Code governing fire protection and fire safety. Mounting of such heating equipment shall conform with section 1108 for low heat appliances except as follows:

**1110.1. Four Inch Clearance.**—When heating boilers and furnaces that are mounted on legs which provide an open ventilated space of not less than four (4) inches in height under the base, the floor shall be protected with not less than one-quarter (1/4) inch mill board covered with sheet metal of not less than No. 24 U.S. gage which shall extend not less than six (6) inches beyond the appliances and not less than eighteen (18) inches where ashes are removed.

**1110.2. Tile Masonry Mounting.**—When heating boilers and furnaces are not mounted on legs, the floor shall be protected with hollow clay or concrete tile masonry not less than four (4) inches in thickness complying with section 1109.4., extending not less than eighteen (18) inches for ash removal.

**1110.3. Water Base Type.**—All floor insulation herein required may be omitted under heating boilers of the water-cooled base type when the water jacket extends under all of the ash pit and fire box or under the entire fire chamber when there is no ash pit.

**1110.4. Mechanical Warm Air Furnaces.**—All floor insulation herein required may be omitted under mechanical warm air furnaces when the fire chamber provides a completely ventilated air space of not less than eighteen (18) inches in height beneath the firing chamber and at least one (1) metal baffle is provided between firing chamber and floor.

**1110.5. One- and Two-Family Dwellings.**—The mounting and clearances herein defined may be modified for heating installations in one- and two-family dwellings as required under the specific provisions in this Code for gas boilers, warm air furnaces, floor furnaces, unit and space heaters.

## **SECTION 1111.0. MOUNTING EXCEPTIONS FOR RESTAURANT APPLIANCES**

Floor mounted restaurant type cooking appliances including ranges, ovens, boilers and similar heating appliances designed

for use in hotel and restaurant kitchens shall conform to section 1108 for low heat appliances except as follows:

**1111.1. Eighteen Inch Clearance.**—When restaurant type appliances are mounted on legs which provide an open ventilated space of not less than eighteen (18) inches in height under the base or which have no burners, oven or broiler within eighteen (18) inches of the floor, no special floor protection shall be required provided there is at least one (1) metal baffle between burners and floor.

**1111.2. Eight Inch Clearance.**—When restaurant type appliances are mounted on legs which provide an open ventilated space of not less than eight (8) inches in height under the base, the floor shall be protected as provided in section 1109.3.

**1111.3. Four Inch Clearance.**—When restaurant type appliances are mounted on legs which provide an open ventilated space of not less than four (4) inches in height under the base, the floor shall be protected as required in section 1109.4.

**1111.4. Double Tile Mounting.**—When restaurant type appliances are not mounted on legs, the floor under the appliance shall be protected as required in section 1109.5. with a double tile base.

## **SECTION 1112.0. MOUNTING EXCEPTIONS FOR DOMESTIC APPLIANCES**

Domestic type floor mounted heating and cooking appliances including stoves, ranges, space heaters, steam and hot water radiators and water heaters, shall conform to section 1108 for low heat appliances except as follows:

**1112.1. Eighteen Inch Clearance.**—When domestic heating and cooking appliances are mounted on legs which provide an open ventilated space not less than eighteen (18) inches in height under the base or which have no burners, oven or broiler within eighteen (18) inches of the floor, no special floor protection shall be required provided there is at least one (1) metal baffle between the burners and the floor.

**1112.2. Four Inch Clearance.**—When domestic heating and cooking appliances are mounted on legs which provide an open ventilated space not less than four (4) inches in height under the base, the floor shall be protected with sheet metal of not less than No. 24 U.S. gage or other approved noncombustible ma-

terial. When solid fuel-fired, the protection shall extend not less than eighteen (18) inches on sides where ashes are removed.

**1112.3. Tile Masonry Mounting.**—When domestic heating and cooking appliances are not mounted on legs, the floor shall be protected as required in section 1109.4.

## **SECTION 1113.0. SIDE AND TOP CLEARANCES**

Clearances shall be provided from wood and other combustible construction in walls, ceilings and partitions adjacent to heating appliances and equipment as follows:

**1113.1. Low Heat Appliances.**—A low heat appliance shall be installed to provide a clearance from combustible material of not less than eighteen (18) inches at the top, sides and rear and of not less than four (4) feet at the front.

**1113.2. Medium Heat Appliances.**—A medium heat appliance shall be installed to provide a clearance from combustible material of not less than (3) feet at the sides and rear, of not less than four (4) feet at the top, and of not less than eight (8) feet at the front or sides where hot products of combustion are removed.

**1113.3. High Heat Appliances.**—A high heat appliance shall be installed to provide a clearance from combustible material of not less than ten (10) feet at the sides and rear, of not less than fifteen (15) feet at the top, and of not less than thirty (30) feet at the front or sides where hot products of combustion removed.

## **SECTION 1114.0. CLEARANCE EXCEPTIONS**

The building official may approve the installation of heating appliances with lesser clearances than specified in section 1113 within the limitations herein provided; and such variations shall be cited in the conditions of approval together with the reason therefor. Heating appliances labeled by authoritative testing agencies which are approved for installation with lesser requirements than herein provided may be installed in accordance with the conditions of such approvals.

**1114.1. Clearance Variations.**—House heating appliances, domestic type ranges and space heaters may be installed with modified clearances as herein specified from combustible materials:

### 1114.1.1 Table 11-1 — Heating Appliance Clearance Variations.

	Clearance in Inches			
	Top	Side and Rear	Front	Smoke-Pipe
Heating boilers and furnaces when water or masonry jacketed.....	6	6	48	18
When jacketed with 1½ inches asbestos cement.....	9	6	48	18
Mechanical warm air with 250 degrees F. temperature limit control	6	6	48	18
Domestic ranges and stoves .....	36	18	36	18
Ranges and stoves with fire clay lining .....	24	18	24	18
Space heaters .....	36	18	36	18
Water heaters .....	12	12	12	18

**1114.2. Gas-Fired Equipment.**—The front clearance for boilers and furnaces which are gas-fired may be reduced to eighteen (18) inches. Gas-fired ranges and steam or hot water radiators may be reduced to six (6) inch front, side and rear clearances. Vent pipes for gas-fired appliances shall conform to section 1011.

**1114.3. Fire Protection.**—The clearances from combustible materials or construction for all types of heating appliances, systems, pipes, flues, and vents which contain hot gases may be decreased from those required elsewhere in this Code when the exposed construction is protected with noncombustible materials to afford the fireresistance specified in table 11-2 or the equivalent protection is secured by an approved arrangement of plates and baffles.

#### 1114.3.1. Table 11-2 Reduced Wall and Ceiling Clearances

Fire-resistance of Protected Construction	Fraction of Specified Clearances	
	Top	Sides and Rear
1 3-hour .....	seven-eighths	five-eighths
1 2-hour .....	three-quarters	one-half
3 4-hour .....	five-eighths	three-eighths
1-hour .....	one-half	one-quarter

**1114.4. Masonry Enclosures.**—When appliances of low or medium heat capacity are insulated on the exterior with approved masonry, the clearances from combustible materials or construction may be reduced to two-thirds (2/3) of the specified clearances.



**SECTION 1115.0. BOILER ROOMS**

**1115.1. Enclosures.**—Except in one- and two-family dwellings, existing three-family dwellings and as specifically required for industrial furnaces and accessory equipment or for high hazard uses in article 4, all heating appliances installed in a building or structure shall be located in a separate room or compartment completely enclosed by floors, walls and ceilings of the required fireresistance; but in no case shall the enclosure of boiler rooms have less than two (2) hour fireresistance for high or medium heat appliances and not less than three-quarter (3/4) hours for low heat appliances.

**1115.1.1. Enclosure Exceptions.**—Electric or fuel fired heat appliances need not be enclosed when they are approved for installation without enclosure and are installed in accordance with the conditions of approval. Boilers and furnaces used in conjunction with industrial processes need not be enclosed, subject to the approval of the building official.

**1115.2. High Hazard Uses.**—When required by the provisions of article 4, all boiler rooms connected with high hazard use groups and special occupancies, including uses involving explosion hazards in section 400.6., dry cleaning plants in section 413.3 and storage or public garages in section 415.5 shall be located in separate buildings or, in rooms enclosed by construction having at least a two (2) hour fireresistance rating. Entrance to such enclosed rooms shall be from the outdoors, or through an intervening vestibule constructed of materials having a two (2) hour fireresistance rating. The floor area of such vestibules shall be at least 50 square feet but not more than 75 square feet. Ventilation shall be provided by a permanently open louvre having a net free area of 80 square inches located in an exterior wall. Vestibule doors shall be 1-1/2 hour self-closing fire doors, with a six (6) inch high sill provided between the vestibule and the boiler room.

**1115.3. Boiler Room Exits.**—In every room containing a boiler, furnace, or incinerator, the maximum travel distance from any point within the room to an exit shall not exceed thirty (30) feet. When two or more exits are so required, all but the main exit may be smaller than specified for required exits in Article 6, but shall not be less than thirty-two (32) inches by forty-eight (48) inches. Requirements of section 618.2 shall be complied with for interior stairs from boiler rooms.

#### **1115.4. Air Supply for Combustion.**

**1115.4.1. Solid and Liquid Fuels.**—All rooms and spaces in which boilers, furnaces and other than gas and electric-fired heating appliances are located shall be provided with sufficient fresh air supply to insure proper combustion. The direct connection of air inlets to ashpits or combustion chambers of boilers or furnaces shall be prohibited. Such air supply inlets for solid or liquid fuel-fired equipment shall have a net area of not less than two (2) square inches for each one thousand (1000) B.T.U. of input rating up to one hundred thousand (100,000) B.T.U. per hour, plus an additional one (1) square inch for each additional one thousand (1000) B.T.U. of input rating or fraction thereof.

**1115.4.2. Gas-Fired Equipment.**—For gas-fired equipment located in enclosed spaces, openings shall be provided near the floor and ceiling of the enclosing wall or partition of not less than one (1) square inch net clear area for each one thousand (1000) B.T.U. input per hour when adequate air supply cannot be provided from the outside or adjacent spaces within the building. Openings to the outer air shall be installed and protected with approved corrosion-resistive screens with not larger than one-half (1/2) inch mesh.

**1115.4.3. Mechanical Ventilation.**—If the ventilation for the purpose of combustion is supplied mechanically, the ventilating system shall be electrically interlocked with the burner, so that when the burner is in operation the ventilating system shall maintain the room in which the equipment is located at a pressure not less than the outdoor atmospheric pressure.

**1115.4.4. Flue Dampers.**—Dampers in flues shall be constructed so that they cannot completely cut off the passage of flue gases at any time. Tight closing dampers may be installed with approved automatic draft and combustion controls.

**1115.5. Boiler Room Ventilation.**—Boiler rooms which contain a medium or high heat appliance shall be provided with gravity or mechanical ventilation complying with articles 5 and 18 to prevent the accumulation of hot air over or near the appliance. All other rooms containing heating appliances shall be provided with gravity or mechanical ventilation.

**1115.6. Boiler Room Location.**—Boiler rooms shall not be located immediately below exitways; nor shall any space heater, floor furnace or other similar equipment be located in any aisle

or passageway used as a required means of egress from the building or structure.

**1115.6.1. Protection for Place of Assembly.**—Rooms containing boilers or furnaces, or other equipment of similar or greater explosion hazard, shall not be located within fifty (50) feet of any place of assembly, unless separated from such place of assembly by construction equivalent to twenty-four (24) inches of brick masonry.

**1115.7. One- and Two-Family Dwellings.**—In one- and two-family dwellings central heating warm air or floor furnaces may be located in utility rooms in the basement or first floor provided the appliances are mounted on noncombustible floor construction of not less than three-quarter ( $3/4$ ) hour fire-resistance, insulated on top with not less than one-quarter ( $1/4$ ) inch asbestos mill board, covered with No. 24 U.S. gage metal or the equivalent. The enclosure of utility rooms on the first floor shall be of noncombustible construction with clearances and ventilation as herein provided. Heating furnaces shall not be installed in attics except of an approved type complying with the mounting and clearance provisions of this article and equipped with type B vents complying with Section 1011.3.

## **SECTION 1116.0. ASH PITS AND BINS**

**1116.1. Ash Pit Enclosures.**—Ash pits and bins shall be constructed of masonry or concrete with walls not less than six (6) inches thick, or of steel or other approved noncombustible materials or combinations thereof as herein provided.

**1116.2. Floors and Roofs.**—The floor and roof of such pits and bins shall be of approved two (2) hour fireresistive construction; and the ceilings of rooms which contain uncovered ash pits shall be constructed of two (2) hour fire-resistance; except that roofs over ash pits may be constructed of approved noncombustible materials.

**1116.3. Opening Protectives.**—All openings to ash storage bins shall be protected with tightly fitted approved sheet metal doors with metal frames and bucks securely anchored to the walls and roof.

## **SECTION 1117.0. STEAM AND HOT WATER PIPES**

**1117.1. Clearances.**—Unless otherwise specifically provided in article 5 for special uses and occupancies, all high pressure

steam pipes shall have a minimum clearance of one (1) inch from all combustible materials; and when such pipes pass through combustible floors or partitions, the openings shall be protected by metal or other approved noncombustible sleeves; and vertical risers arranged in groups extending through two (2) or more stories shall be enclosed in a shaft of fireresistive construction as specified in section 1018. The clearance of low pressure steam and hot water piping in walls, floors, and ceilings of combustible construction shall be not less than one-half (1/2) inch.

**1117.2. Floor Sleeves.**—When heating pipes pass through floors which may be subject to serious flooding, metal sleeves shall be installed to a height of at least six (6) inches above the finished floor surface and shall be provided with perforated cap plates.

**1117.3. Fire-stopping.**—When heating pipes pass through floors and partitions, the open sleeve space shall be filled with noncombustible materials.

**1117.4. Insulation.**—All coverings or insulation used on steam and hot water pipes shall be of approved noncombustible materials; and where such pipes pass through stock shelving or are in close proximity to other combustible materials, the insulation shall be not less than one (1) inch thick.

**1117.5. Freezing Temperatures.**—All concealed heating pipes located in exterior walls shall be protected against freezing in accordance with the approved rules.

**1117.6. Expansion and Contraction.**—All heating pipes shall be installed to provide for all expansion and contraction movements due to temperature changes.

## **SECTION 1118.0. HEATING PANELS**

Air chambers or spaces in walls, partitions or ceilings used as heat exchangers in warm air heating systems shall be used only with automatic temperature limit controls that cannot be set at more than two hundred (200) degrees F. Such spaces shall be entirely enclosed with noncombustible material with noncombustible interior linings. Where hung or supported from the wall or floor construction, the bases, hangers and other supports shall be of steel or other approved noncombustible materials.

**SECTION 1119.0. HOT AND COLD AIR DUCTS**

**1119.1. Hot Air Ducts.**—Hot air ducts for both low and high temperature systems shall be constructed entirely of noncombustible material equivalent in structural strength to the materials specified in tables 10-4 and 10-5 of section 1019. All vision panels for inspection purposes shall be constructed of wired glass or tightly fitted and secured metal panels.

**1119.2. Cold Air Ducts.**—Cold air ducts shall comply with all the provisions governing hot air supply ducts except in respect to the requirements for heat insulation and clearance from combustible construction.

**1119.3. Floor Openings.**—Where warm air ducts pass through combustible floors, the surrounding space shall be tightly fitted with asbestos cement or other noncombustible insulating material. Where such ducts enter combustible floors, walls or partitions within six (6) feet of the heating furnace, a five-sixteenth ( $5/16$ ) inch clearance shall be provided around the duct for the entire six (6) foot length. Where required fire-stopping is removed from walls, floors and partitions by the passage of ducts, the surrounding space shall be completely filled with asbestos, mineral wool or other noncombustible materials.

**1119.4. Integral Ducts and Plenums.**

**1119.4.1. Duct Construction.**—When hot air ducts form an integral part of the structure, the duct walls shall be constructed of not less than one-half ( $1/2$ ) hour fireresistance except as provided for within Section 1019.

**1119.4.2. Attic Plenums.**—The attic space, if unoccupiable and of incombustible construction, may be used as supply or return air plenum provided the system is mechanical and all return air registers are provided with automatic incombustible dampers.

**1119.4.3. Plenum Construction.**—The spaces within the envelope of noncombustible roof and floor construction may be used as plenums provided that:

- a. The ratio of the area of ceiling penetrations to ceiling area does not violate that permitted for the required fire rating of the assembly.
- b. The integrity of the firestopping and fire separations is not destroyed.
- c. All electric wiring conforms with article 15.
- d. The ceiling material shall not be subject to deterioration or deformation from long exposure to temperatures of

250° F., or from conditions of high humidity, excessive moisture and mildew.

- e. The ceiling material shall be supported by noncombustible materials having a melting point above 1400° F.
- f. The air entering shall not exceed 250° F.
- g. Adequate provisions to prevent deterioration of structural components from condensation shall be made.

**1119.5. Insulation.**—Only noncombustible exterior covering shall be used on ducts carrying air at a temperature of more than two hundred (200) degrees F. and on the interior of ducts when required.

**1119.6. Clearances.**—Clearances of hot air metal ducts from unprotected combustible construction shall be not less than one (1) inch unless the duct is insulated with not less than one-half (1/2) inch of approved noncombustible materials or the exposed construction is protected to afford not less than one-half (1/2) hour fire resistance.

**1119.7. Air Recirculation.**—No return duct of a mechanical warm air system shall be permitted from a kitchen, bathroom or garage or other place in which flammable or noxious vapors may be present; nor shall the recirculation of air from one dwelling unit to another dwelling unit be permitted.

**1119.8. Air Filters.**

**1119.8.1. Construction.**—Air filters shall be of a flame-resistive type which do not give off large volumes of smoke or other objectionable products of combustion in the event of fire. Air filters shall be kept clean in accordance with the approved rules.

**1119.8.2. Filter Coatings.**—Liquid adhesive coatings used on filters shall have a flash point not less than three hundred and fifty (350) degrees F. in an open cup tester.

**1119.9. Air Conditioning.**—The construction and installation of fire doors, dampers, fresh air inlets, emergency controls and fire-extinguishing equipment and outlets for air conditioning, ventilating and heating systems in other than one- and two-family dwellings shall comply with the provisions of article 18.

## **SECTION 1120.0. WARM AIR HEATING SYSTEMS**

**1120.1. Classification.**—Warm air heating systems in one- and two-family dwellings shall be classified as follows:

**1120.1.1. Low Temperature Systems.**—Low temperature systems shall include all systems which use low pressure steam or hot water for heating the air and those systems which have automatically fired warm air furnaces equipped with fans to circulate the air. The operation shall be controlled by automatic limit temperature controls that cannot be set higher than two hundred (200) degrees F.

**1120.1.2. High Temperature Systems.**—High temperature systems shall include all gravity warm air hand-fired and automatically controlled systems in which the temperature limit controls can be set above two hundred (200) degrees F.; and any other system that does not conform to the requirements for low temperature systems.

**1120.2. Furnace Controls of Low Temperature Systems.**

**1120.2.1. Automatic Shut-Off.**—The furnaces of an automatically-fired low temperature system which is equipped with an air-circulating fan shall be provided with an approved automatic control of the fuel supply whenever the temperature of the air in the furnace bonnet or at the main supply duct exceeds two hundred (200) degrees F.

**1120.2.2. Over-Run Control.**—When the furnace is stoker-fired, it shall be equipped with an automatic over-run control to operate the fan when the air in the furnace bonnet or as the main supply duct reaches a temperature of two hundred (200) degrees F. after the stoker and fan have shut down in normal operation.

**1120.3. Furnace Controls of High Temperature Systems.**—A high temperature system which has an automatic fuel supply controlled by thermostat shall have the same controls as a low temperature system; except that the temperature setting may permit a maximum of two hundred and fifty (250) degrees F.

**1120.4. Warm Air Furnaces.**

**1120.4.1. Mounting and Clearances.**—The mounting of warm air heating furnaces shall comply with section 1110 and clearances with section 1114. Top clearances shall be measured from the top of the furnace bonnet or the warm air plenum chamber, whichever is higher.

**1120.4.2. Gravity Systems.**—Gravity warm air furnaces shall be encased in a double metal casing with intervening air space extending from the top of the casing down to the bottom of the fire-box. The top of the bonnet shall be insulated with not less than three (3) inches of sand or the equivalent in magnesia,

asbestos or other approved noncombustible material. Gravity furnaces shall be equipped with automatic controls to shut off the fuel supply when the temperature of the warm air pipe at any point within twenty-four (24) inches of the furnace exceeds two hundred and fifty (250) degrees F.

#### **1120.5. Registers.**

**1120.5.1. Combustible Construction.**—When a register is located in a floor or wall of combustible construction, the register box shall be covered with twelve (12) pound asbestos paper and a clear space of not less than five-sixteenth ( $5/16$ ) inch shall be left between the sides of the box and any combustible material.

**1120.5.2. Over-Head Furnace Register.**—When a register is installed in the floor over the furnace, the register box shall be of double construction, with an intervening air space of not less than four (4) inches, except when the warm air duct is surrounded by a cold air passage.

**1120.5.3. Non-Automatic System.**—A system which is not automatically fired and which is not equipped with an approved temperature limit control shall be provided with dampers and shutters which are not capable of shutting off more than eighty (80) percent of the total duct area; or in lieu thereof, one register or grille shall be installed without a closeable shutter, and the duct leading thereto shall be installed without a damper.

**1120.5.4. Return Air Connections**—Registers on more than one floor shall not be connected to the same vertical duct stack for return air to the heater.

### **SECTION 1121.0. CENTRAL RECIRCULATING SYSTEMS**

**1121.1. Air Supply**—A central fan heating system of the recirculating type for use in structures with large open areas such as garages and airplane hangars, shall provide a positive air recirculation of at least one (1) cubic foot per minute when the average ceiling height is fifteen (15) feet or less; and with greater heights the air recirculation shall be increased proportionately; but in no case shall less than five (5) percent of the air moved by the fan be taken directly from outside the building.

**1121.2. Air Duct.**—Air ducts for fresh air supply shall be installed without dampers and shall be fully open at all times.



**SECTION 1122.0. FLAMMABLE VAPOR SYSTEMS**

**1122.1. Exhaust Outlet.**—A duct designed to remove flammable vapors from a room of a building or structure under the requirements of section 403 shall lead as directly as possible to the outside air and the outlets shall be kept not less than ten (10) feet clear from combustible construction or finish.

**1122.2. Location of Ducts.**—Flammable vapor ducts shall not be incorporated in a wall except to pass directly through it. Such ducts shall never be located in a fire wall or a fire division wall.

**1122.3. Transmission of Power.**—The motive power for fans located within the room from which flammable vapors are removed shall be transmitted from an outside source through a shaft operating in a bushed shaft hole, unless otherwise approved by the building official.

**SECTION 1123.0. UNIT HEATERS**

**1123.1. Clearances.**—Steam and hot water heaters shall be installed to provide clearances from combustible material of not less than one (1) inch to all heated portions thereof, including the steam and hot water supply piping.

**1123.2. Supports.**—All ceiling type direct-fired unit heaters shall be substantially supported by metal hangers, brackets or other approved noncombustible supports with the clearances specified for low heat appliances in sections 1113 and 1114.

**1123.3. Wall Heaters.**—A wall heater shall not be located in a wall of combustible construction unless approved by the building official and shall be installed in accordance with the conditions of such approval.

**1123.4. Fireplace Heaters.**—Unit gas-fired heaters, labeled for use in fireplace recesses, shall not be used elsewhere.

**1123.5. Room Heaters.**—The installation or use of unlisted electric room heaters is prohibited. The installation or use of unlisted or unvented gas, oil or other fuel burning room heaters is prohibited.

**SECTION 1124.0. FLOOR FURNACES**

**1124.1. Location.**—A floor furnace shall be located so as to be readily accessible and shall not be installed in the floor of

any corridor, aisle or passageway, nor in any exitway in a place of public assembly; nor shall any but a gas-fired floor furnace be installed above the first story of a building, and then only when the furnace assembly projects below the floor into a non-habitable space, enclosed in two (2) hour fire-resistant walls, with clearances of at least six (6) inches on all sides and bottom, except as provided for one- and two-family dwellings in section 1124.5.

**1124.2. Enclosures.**—Enclosures of floor furnaces shall be constructed entirely of noncombustible materials with a fire-resistance rating of not less than three-quarter (3/4) hours, provided with suitable means for combustion-air intake which furnishes adequate direct air supply to insure proper combustion complying with section 1115.4 and with means of access for purposes of servicing the furnace.

**1124.3. Furnace Supports.**—Floor furnaces shall be installed only in floors of noncombustible construction of not less than two (2) hours fire-resistance, except as provided for one- and two-family dwellings in section 1124.5 with the following clearances:

**1124.3.1. Pit Clearances.**—Such floor furnaces, when other than gas-fired, shall be mounted independently of the floor grille with the following clearances: six (6) inches at the bottom and twelve (12) inches at the sides, except that the clearance on the control side shall be not less than eighteen (18) inches.

**1124.3.2. Pit Waterproofing.**—When there is likelihood of water rising above the bottom clearance, the pit shall be constructed with an approved watertight enclosure with the sides extending not less than four (4) inches above the ground level.

**1124.3.3. Pit Access Openings.**—The access foundation wall opening or floor trap door shall be at least eighteen by twenty-four (18x24) inches in size; and the under floor passage to the furnace shall be at least twenty-four by twenty-four (24x24) inches in cross-section.

**1124.4. Furnace Clearances.**—Floor furnace clearances shall comply with section 1114 and flue and vent clearances with section 1011.

**1124.5. One- and Two-Family Dwellings.**—Furnace enclosures may be constructed of noncombustible materials with a fire-resistance of not less than three-quarter (3/4) hours and a minimum clearance of six (6) inches at sides and bottom for servicing. Means shall be provided for supporting the furnace when the floor grille is removed.

**1124.6. Pressure Regulator.**—The outlet duct temperatures shall be not greater than two hundred and fifty (250) degrees F. unless such installation is specifically approved by the building official; and in gas-fired furnaces, a gas pressure regulator shall be provided so that the gas input does not exceed the manufacturer's rating.

## **SECTION 1125.0. INDUSTRIAL FURNACES AND POWER BOILERS**

Industrial furnaces and power boilers shall be designed and installed to provide fire and structural safety based on their character, size, temperature and explosion hazard in accordance with accepted engineering practice and within the limitations of this Code for high heat appliances.

**1125.1. Foundations of Furnaces.**—Foundations for high heat boilers, furnaces and other appliances shall be isolated and insulated from floor slabs, foundations and footings of the building. The foundation bed shall be properly insulated to avoid disintegration or other structural injury of the foundation due to high temperatures.

### **1125.2. Structural Insulation.**

**1125.2.1. Structural Frame.**—The furnace setting and supports shall not be located in direct contact with unprotected structural steel or reinforced concrete framing, but shall be insulated or separated therefrom by a clearance of not less than six (6) inches.

**1125.2.2. Heat Insulation.**—Steel or reinforced concrete framing adjacent to a boiler or furnace in industrial plants and subject to temperatures in excess of seven hundred and fifty (750) degrees shall be protected with fireproofing of not less than four (4) hour fireresistance, or the design stress shall be reduced to provide structural safety.

**1125.3. Air Supply.**—Sufficient air supply for combustion shall be provided in conformity to section 1115.4.

**1125.4. State Approval.**—Thermal energy utilization units and appurtenances having an energy input capacity of at least one hundred million (100,000,000) B.T.U. per hour require the written approval of plans and specifications by the Massachusetts Department of Public Health in accordance with rules and regulations promulgated in accordance with Section 142B, Chapter 111, of the General Laws.

## **SECTION 1126.0. UNFIRED PRESSURE VESSELS**

All unfired pressure vessels shall comply with the construction, clearance and fire protection requirements of this article for high pressure boilers designed for the generation of steam or power and with the boiler code standards listed in Reference Standard RS 11-1.

**1126.1. Inspection.**—An owner or user shall not permit the operation or use of an unfired pressure vessel until such installation has been inspected for structural strength and safety and a certificate of operation has been secured from the building official or other authorized agency.

**1126.2. Certificate.**—The certificate of approval shall be valid for a period of one (1) year from date of inspection and shall state the maximum pressure which may be maintained in the vessel.

## **SECTION 1127.0. RESTAURANT COOKING APPLIANCES**

All ranges, ovens, broilers and other miscellaneous low heat appliances of the types designed for floor mounting in hotel and restaurant kitchens shall comply with the provisions of sections 1111 and 1114 for low heat appliances and with the provisions of Article 18 for the ventilation of cooking equipment.

## **SECTION 1128.0. HOT WATER SUPPLY HEATERS**

All range boilers, hot water heaters and storage tanks shall be equipped with temperature limit controls, temperature relief valves, and pressure relief valves as herein required.

**1128.1. Automatic Hot Water Supply.**—Automatic or remote control ignition equipment on domestic hot water heating devices using gas or liquid fuel shall be installed only in connection with a burner equipped with a safety pilot or other approved device arranged to automatically shut off the fuel supply to the main burners if the pilot flame is extinguished. All gas water heaters with an automatic remote-control pilot; or with means of lighting other than a manual method, shall be equipped with approved down draft diverters on the flue pipe from the heater arranged to prevent extinguishment of the pilot or heating flame in accordance with section 1012.2.

**1128.2. Direct-Fired Gage Equipment.**—Approved relief valves and pressure gages shall be installed in all direct-fired cast iron water heaters with cored sections, and in all heaters with a check valve located between the water meter and the heater or tank.

**1128.3. Pressure Relief Valves.**—The rate of discharge of pressure relief valves shall limit the pressure rise to ten (10) per cent of the pressure at which the valve is set to open for any given heat input.

**1128.4. Temperature Relief Valves.**—Temperature relief valves shall be capable of discharging sufficient hot water at two hundred and ten (210) degrees F. without any further rise in temperature.

**1128.5. Vacuum Relief Valves.**—All tanks shall be equipped with approved vacuum relief valves.

**1128.6. Relief Outlet Wastes.**—The size of relief outlet waste valves shall be not less than the cross-sectional area of the valve discharge outlet. No pressure, temperature or other type relief valve shall discharge directly to the building drainage system.

**1128.7. Prohibited Uses.**—No solid or liquid fuel or gas-fired water heaters shall be installed in bathrooms, bedrooms, or other habitable spaces or in any enclosed space with a volume of less than three hundred (300) cubic feet; nor shall vent pipes designed for use with gas appliances be used with solid or liquid fuel-fired equipment except as provided in section 1005.9. for alternate flue construction.

## **SECTION 1129.0. GAS-FIRED EQUIPMENT**

All gas-fired equipment must conform to the requirements of Article 17, Plumbing, Drainage and Gas Piping, and to the rules of the Commonwealth of Massachusetts Department of Public Utilities covering gas distribution systems.

## **SECTION 1130.0. THROUGH 1132.0. OMITTED**

## **SECTION 1133.0. OIL BURNING EQUIPMENT**

All installations and actions with reference to Oil Burners, Fuel Oil Tanks and Equipment, Interior Storage Tanks, and Exterior Storage Tanks are covered by and must conform to

FPR-3, RULES AND REGULATIONS made in accordance with the provisions of G.L. 148, as amended, governing the construction, installation and operation of OIL BURNING EQUIPMENT and the keeping, storage and use of fuel oil or other inflammable liquid products used in connection therewith.

## **SECTION 1134.0. DRYING ROOMS**

A drying room or dry kiln installed within a building shall be constructed entirely of approved noncombustible materials or assemblies of such materials with the required fireresistance rating based on the fire hazard of the contents and the process as regulated by the approved rules or as required in article 4 for special uses.

**1134.1. Piping Clearance.**—All overhead heating pipes shall have a clearance of not less than two (2) inches from combustible contents of the dryer.

**1134.2. Insulation.**—When the operating temperature of the dryer is one hundred and seventy-five (175) degrees F. or more, metal enclosures shall be insulated from adjacent combustible materials by not less than twelve (12) inches of air space, or the metal walls shall be lined with one-quarter (1/4) inch asbestos mill board or other approved equal insulation.

**1134.3. Fire Protection.**—Drying rooms designed for high hazard materials and processes, including dry cleaning and other special uses provided for in article 4, shall be protected by approved automatic sprinkler or fog systems, manually controlled steam smothering systems, or other approved fire-extinguishing equipment conforming to the provisions of article 12.

## **SECTION 1135.0. INCINERATORS**

**1135.1. Compliance.**—All incinerators in buildings shall be constructed, installed and altered in accordance with the requirements of this article. Incinerators having a nominal rated capacity of 10 tons (short) or more per 24 hours of continuous operation, or a horizontal combustion grate area (equivalent) of 10 square feet or more, require the written approval of the Massachusetts Department of Public Health in accordance with rules and regulations promulgated under Section 142B of Chapter 111 of the General Laws.

**1135.1.1. Standards.**—The provisions of Reference Standard RS 11-2 shall be a part of this section.

**1135.2. Types of Chute-fed Incinerators.**

**1135.2.1. Semiautomatic Incinerators.**—Semiautomatic incinerators shall be limited to capacities of not more than 500 habitable rooms in buildings classified in residential occupancy group L; and to capacities not exceeding 1,700,000 B.T.U. per hour in other buildings. Semiautomatic incinerators may have manually operated grates, but shall have automatically operated chute gates, gas or oil burners with temperature controls, overfire air fans and nozzle system, emission control devices, and clock controlled cycles.

**1135.2.2. Automatic Incinerators.**—Automatic incinerators shall be required for capacities of over 500 habitable rooms in buildings classified in residential occupancy group L and for capacities exceeding 1,700,000 B.T.U. per hour in other buildings. They are optional for smaller capacities. Automatic incinerators shall have power operated grates, and automatically operated chute gates, gas or oil burners with temperature controls, overfire and underfire air fans and nozzle system, emission control devices and clock controlled cycles.

**1135.3. Incinerator Rooms.**—Incinerators and refuse collecting bins and spaces shall be located in rooms or compartments used for no other purpose. Such rooms or compartments shall be separated from all other occupancies by construction having a fire resistance rating of at least two (2) hours. Refuse collection bins and spaces shall be sprinklered in accordance with the provisions of article 12.

**1135.3.1. Ventilation.**—Fixed ventilation for combustion air to the incinerator room shall be provided by a louvered opening in a wall to outdoor air. When ducts are used, they shall be sized and installed so as to provide the amount of air required for combustion, taking into consideration head loss. Fans may be installed to deliver air to the incinerator room, provided they are in operation whenever the incinerator is in use. Louvers, ducts, and fans shall be sized to deliver at least 2.5 cfm of air for each pound per hour of refuse while burning is taking place. All duct work shall be installed in accordance with the requirements of articles 10 and 18.

**1135.3.2. Draft Control.**—If a manual damper or automatic draft controller is provided in the incinerator flue, it shall be

capable of closing off not more than 95 percent of the flue area, and the damper or controller shall be made of such materials and in such a manner so as to prevent warping, binding, cracking, corrosion, and distortion when exposed to operating temperatures. If an automatic draft controller is used, means shall be provided for temporary manual operation.

**1135.4. Charging Chutes and Exhaust Flues.**—All incinerators shall be constructed with a flue within a chimney to exhaust the products of combustion and a refuse charging chute which shall be separate from the flue. Refuse charging chutes shall not discharge directly into incinerators, except in buildings classified in residential occupancy group L and in accordance with the requirements of this article and article 10.

**1135.4.1. Charging Gates.**—Charging gates, when provided, shall be power operated. Gates and guide rails shall be of such materials and construction so as to withstand a temperature of 2000° F. without distortion, warping, binding, cracking, or corrosion, and also to withstand impact by heavy falling objects.

**1135.5. Auxiliary Heat.**—Burners or other sources of heat shall be provided for all incinerators. Such heat sources shall be capable of maintaining a temperature of at least 1500° F. at the discharge from the combustion chamber, and shall be equipped with safety devices to shut off the fuel in cases of ignition failure, flame failure, or insufficient draft.

**1135.6. Construction of Incinerators.**

**1135.6.1. General.**—Incinerators shall be constructed so as to be gas tight and shall be lined or protected with heat resistive materials suitable for the services required.

**1135.6.2. Masonry Incinerators.**—When the combined hearth and grate area is twenty (20) square feet or less, or the number of habitable rooms served is one hundred (100) or less, combustion chambers, separation chambers, and connecting gas passages shall be constructed of eight (8) inch thick common brick and lined with four and one-half (4-1/2) inches of refractory material with an intervening air space of one (1) inch. When the combined hearth and grate area is more than twenty (20) square feet or the number of habitable rooms served is more than one hundred (100), combustion chambers, separation chambers and connecting gas passages shall be constructed of eight (8) inch thick common brick and lined with nine (9) inches of refractory material with an intervening air space of one (1) inch.



**Ties.**—Noncorroding metal ties shall be used at least every fifth course of common brick. Structural steel angles, straps, and tiebacks shall be installed on all masonry incinerators having more than one hundred twenty-five (125) cubic feet of combustion chamber volume.

**Interior Construction.**—Interior walls, curtain walls, bridge walls, or baffles shall, in every case, be of refractory brick, at least nine (9) inches thick.

**Arches.**—Sprung arches may be used if the span is less than four (4) feet. Flat suspended type arches shall have a minimum of five (5) inches of refractory material between the furnace heat and the hangers. Flat suspended arches shall have an insulated block roof of at least two and one-half (2-1/2) inches thick.

**Isolation.**—No structural supports for the vertical building flues or other parts of the building shall rest upon the incinerator; nor shall any metal guides, hangers, or structural steel parts of the incinerator be exposed to direct heat of combustion.

**Thermal Block Insulation.**—High temperature block insulation shall be at least equal to type 3 specified in reference standard RS 11-3.

**Refractory.**—Refractory material shall be firebrick or hydraulic setting castable refractory.

- a. **Firebrick.**—Firebrick shall be high duty, spall resistant and conform to type A reference standard RS 11-4.
- b. **Castable refractories.**—Castable refractories shall conform to reference standard RS 11-5. (Class F)
- c. **Mortar.**—Mortar for firebrick shall be air setting high temperature cement conforming to reference standard RS 11-6.

**1135.6.3. Steel-Cased Incinerators.**—In lieu of the eight (8) inch common brick outer wall and one (1) inch air space required in section 1135.6.2, the outside enclosure of incinerators may be of No. 12 manufacturers standard gage steel casing that is welded, riveted, or bolted to be gas-tight, with at least two thicknesses of two and one-half (2-1/2) inches high-temperature block insulation applied with staggered joints.

**1135.6.4. Other Constructions.**—Other forms of incinerator construction, equivalent in terms of structural strength, insulating

value, and temperature and erosion resistance, may be used, subject to approval by the building official.

**1135.6.5. Construction of Chimneys and Charging Chutes.**— For requirements governing the construction of chimneys and charging chutes, see article 10.

**1135.7. Cleanouts.**— Openings shall be provided so that all parts of the incinerator can be cleaned, including the ash pit, the combustion chamber, the passes of separation chambers, and the incinerator flue. Cleanouts shall be closed by tight fitting doors or covers, securely latched or otherwise held in a closed position. Ash pit and combustion chamber closures and frames shall be of cast iron or equivalent, with the frames securely attached to the incinerator.

**1135.7.1. Accessibility.**— Sufficient space shall be provided around the incinerator and its appurtenances to facilitate cleaning, repair, and servicing. Clearance shall be provided to allow the cleanout doors to be completely opened so that all parts of the combustion chamber, ash pit, separation chambers, etc., may be reached and so implements used for this purpose can be freely manipulated. All dampers, gates, burners, valves, levers, etc., shall be accessible for repair and adjustment or replacement. No construction shall be located closer than sixteen (16) inches to any part of an incinerator, except that noncombustible structural member two (2) feet wide or less parallel to the incinerator, may be located as close as six (6) inches to the incinerator, provided such members do not reduce accessibility to any moving parts of the incinerator.

**1135.8. Cabinets and Control Wiring.**— All control equipment shall be installed in dustproof, noncombustible cabinets. Such cabinets shall not be mounted on the incinerator. Conduits carrying control wiring for the incinerator shall not be fastened to the incinerator. All electrical work shall comply with the Massachusetts Electrical Code.

**1135.9. Instructions.**— Operating and maintenance instructions shall be permanently and conspicuously mounted under transparent protective covers in the incinerator room, together with the equipment use permit. The instructions shall include complete procedures for operating and maintaining fuel burners, dampers, and other devices, and shall state quantities and kinds of materials that may be burned.

**1135.9.1. Posting.**— On every door that opens into a space in which a service opening into a refuse chute is located, or on

the wall directly over the service opening into the chute, the following sign shall be permanently and conspicuously posted: "THROWING LIGHTED MATCHES, CIGARS OR CIGARETTES, CARPET SWEEPINGS, NAPHTHALENE, CAMPHOR BALLS OR FLAKES, FLOOR SCRAPINGS, OIL SOAKED RAGS, EMPTY PAINT CANS, AEROSOL CONTAINERS, OR ANY OTHER FLAMMABLE OR HIGHLY COMBUSTIBLE OR EXPLOSIVE SUBSTANCE INTO THIS CHUTE IS UNLAWFUL AND SUBJECTS THE OFFENDER TO A PENALTY". Such signs shall be designed as follows:

- a. Signs on doors leading to the service openings and on walls over service openings shall be at least eight (8) inches wide and three (3) inches high, with lettering at least one-quarter (1/4) inch high. The signs shall be located on the hall side approximately five (5) feet above the floor.
- b. The lettering of the signs shall be of bold type, and shall be properly spaced to provide good legibility. The lettering and the background shall be of contrasting colors.
- c. Signs shall be durable and shall be securely attached to the door or wall.
- d. Sufficient lighting shall be provided so that the signs are easily readable at all times.

## **SECTIONS 1136.0. AND 1137.0. OMITTED**

### **SECTION 1138.0. REFUSE CHUTES**

**1138.1. Chute Discharge.**—A refuse chute shall not feed directly to the combustion chamber of an incinerator, except as provided in section 1135.4., but shall discharge into an enclosed room or bin separated from the incinerator room by ceiling and walls of not less than two (2) hour fireresistance, unless otherwise approved by the building official.

**1138.2 Construction.**—Refuse charging chutes for incinerators or refuse reduction systems which utilize methods other than burning shall be constructed in accordance with the applicable provisions of article 10.

**1138.3. Opening Protectives.**—All openings between refuse rooms, chutes and incinerator rooms shall be protected with

one and one-half (1-1/2) hour fire doors or their approved labeled equivalent complying with article 9.

## SECTION 1139.0. REFUSE VAULTS

**1139.1. Refuse Vault Enclosures.**—A vault for receiving combustible refuse from an exhaust system shall be constructed of not less than three (3) hour fireresistive assemblies.

**1139.2. Openings to Boiler Rooms.**—The opening between a vault and a boiler room shall not exceed nine (9) square feet in area and shall be located at least eight (8) feet from the firing door of the boiler, and the bottom of the opening shall be not less than six (6) inches above the boiler room floor. All openings shall be equipped with approved automatic fire doors of not less than one and one-half (1-1/2) hour fireresistance rating or the approved labeled equivalent complying with article 9.

**1139.3. Location.**—When located within a building, a refuse vault shall extend above the roof or shall be directly vented to the outer air with ducts complying with article 10.

**1139.4. Fire Protection.**—A vault for combustible refuse which exceeds three hundred and sixty (360) cubic feet in volume shall be protected by an automatic sprinkler or other approved automatic fire-extinguishing system conforming to article 12.

## SECTION 1140.0. BLOWER AND EXHAUST SYSTEMS

**1140.1. Ducts for Blower Systems.**—The ducts for blower and exhaust systems for disposal of dust, stock and vapors from industrial and material processes shall be constructed of metal or other approved noncombustible materials as provided in table 11-3 for transporting non-abrasive and abrasive materials and table 11-4 for clearance of ducts carrying flammable vapors and dust from combustible construction. For vapor and dust temperatures in excess of nine hundred (900) degrees F., all ducts shall be lined with approved refractory materials.

**1140.1.1. Table 11-3.**—

**Thickness of Steel Sheet Exhaust Ducts in U.S. Standard Gage**

Diameter in inches	Non-abrasive	Abrasive
Less than 9 .....	24	20
9 to 18 .....	22	18
18 to 30 .....	20	16
30 to 36 .....	18	14
More than 36 .....	16	12

**1140.1.2. Table 11-4. —****Clearance of Exhaust Ducts in Inches**

Temperature of vapor or dust in degrees F.	3 to 8 inch ducts	Over 8 inch ducts
175 to 600 .....	8	12
600 to 900 .....	18	24
Higher than 900 .....	24	24

**1140.2. Chutes.**—No room, hallway, attic, or other part of a building or structure and no hollow or other concealed space in walls or partitions shall be used as an integral part of a blower or exhaust system handling combustible materials or vapors, unless designed and constructed as required for approved chutes in section 1138 or approved ducts for flammable vapor systems in section 1122.

**1140.3. Location of Fan.**—The fan for blowing flammable materials or vapors shall comply with the approved rules and shall be located and installed so as to be readily accessible. No fan for blowing flammables shall be located in a fire wall or fire division wall.

**1140.4. Electric Ground.**—All metal parts of the apparatus used for blower and exhaust systems and all shafting in connection therewith shall be electrically grounded as required in the Massachusetts Electrical Code.

## **SECTION 1141.0. DUST, STOCK AND REFUSE CONVEYOR SYSTEMS**

**1141.1. Power Transmission.**—Power for fans located in rooms from which flammable dust is being removed shall be transmitted by means of a shaft passing through a bushed hole, or by a belt, chain or similar driving mechanism which is encased in a metal or other noncombustible dust-tight enclosure, both within and without the room.

**1141.2. Collectors and Separators.**—Cyclone collectors and separators and their supports shall be constructed of noncombustible materials and shall be located whenever possible on the exterior of the building or structure. In no case shall a collector or separator be located nearer than ten (10) feet to combustible construction or to an unprotected wall or floor

opening, unless the collector is provided with a metal vent pipe which extends above the highest part of any roof within a distance of thirty (30) feet.

**1141.3. Discharge Pipes.**—Discharge pipes shall conform to all the requirements for ducts including clearances required for high heat appliances in articles 10, 11 and 18. A delivery pipe from a cyclone collector shall not convey refuse directly into the fire-box of a boiler, furnace, dutch oven, refuse burner, incinerator or other appliance which utilizes induced or forced draft.

**1141.4. Vents for Exhaust Conveyor Systems.**—An exhaust system shall be vented to the outside of the building either directly by flue, or indirectly through the separator, bin, or vault into which it discharges.

**1141.5. Spark Protection.**—The outlet of an open air vent shall be protected with an approved metal or other noncombustible screen or by other equally efficient means to prevent the discharge of sparks.

**1141.6. Explosion Relief Vents.**—A safety or explosion relief vent shall be provided on all systems which convey combustible refuse or stock of an explosive nature, in accordance with the requirements of article 4.

**1141.6.1. Screens.**—When a screen is used in a safety relief vent, it shall be so attached as to permit ready release under emergency pressure.

**1141.6.2. Hoods.**—The relief vent shall be provided with an approved noncombustible cowl or hood, or with a counter-balanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.

## REFERENCE STANDARD RS 11 HEATING EQUIPMENT AND APPLIANCES— MOUNTING, CLEARANCES AND CONNECTIONS

### List of Reference Standards RS 11

- RS 11 ASME 1968  
Boiler and Pressure Vessel Code, Section VIII, and  
Addenda—Winter 1969
- ASTM C106 1967  
Fireclay Brick & Silicon Carbide Brick for Incinerator  
Service
- ASTM C401 1968  
Castable Refractories
- ASTM C178 1947  
Air-Setting Refractory Mortar (Wet Type) for Boiler  
& Incinerator Services
- ASTM C612 1967  
Mineral Fiber Block and Board Thermal Insulation
- ASTM E 84 1968  
Method of Test for Surface Burning Characteristics of  
Building Materials
- ASTM D 93 1966  
Method of Test for Flash Point (closed cup) Flash  
Point by Pensky-Martens Closed Tester
- ASTM C105 1947  
Ground Fire Clay as a Mortar
- IIA 1968  
Incinerator Standards
- NFPA 90B 1968  
Standard for the Installation of Residence Type Warm  
Air Heating System

NFPA 91 1961  
Standard for the Installation of Blower and Exhaust  
Systems for Dust, Stock and Vapor Removal or  
Conveying.

Note: Whenever in these standards reference is made to the  
“National Electric Code” the work so covered shall meet the  
requirements of the Massachusetts Electric Code.

**RS 11-1** ASME 1968  
Boiler and Pressure Vessel Code Section VIII Rules  
for construction of unfired pressure vessels

**RS 11-2** IIA 1968  
Incinerator Standards

MODIFICATIONS.—The provisions of IIA 1968  
shall be subject to the following modifications. The  
section and page numbers are from that standard

Page 3A, Classification of Incinerators—Delete last  
sentence of paragraph regarding Class II incinerators  
and substitute the following:

“Class II incinerators are prohibited in the City of  
Boston”

Page 2B, Section 1.3., Class II Incinerators—Delete  
entire section and substitute the following:

“Class II incinerators are prohibited in the City of  
Boston ”

**RS 11-3** ASTM C612 1967  
Mineral Fiber Block and Board Thermal Insulation

**RS 11-4** ASTM C106 1967  
Fireclay Brick and Silicon Carbide Brick for Incin-  
erator Service

**RS 11-5** ASTM C401 1960  
Castable Refractories

**RS 11-6** ASTM C178 1947  
Air setting Refractory Mortar



**FIRE PROTECTION AND  
FIRE-EXTINGUISHING EQUIPMENT**

1200.0	Scope	1210.0	Yard Hydrants
1201.0	Definitions	1211.0	Piping for Standpipes
1202.0	Plans and Specifications	1212.0	Pier and Wharf Protection
1203.0	Acceptance Tests	1213.0	Automatic Sprinkler Systems
1204.0	Periodic Inspections and Tests	1214.0	Sprinkler Water Supplies
1205.0	Maintenance	1215.0	Omitted
1206.0	Existing Buildings and Fire Service Equipment	1216.0	Omitted
1207.0	Standpipe Requirements	1217.0	Special Fire Protection
1208.0	Standpipe Water Supplies	1218.0	Manual Fire-Extinguishing Equipment
1209.0	Dry Standpipe Fire Lines	1219.0	Interior Fire Alarm Systems
		RS 12	Reference Standards

**TABLES**

12-1	1207.4.1.	Size of Standpipe Risers
12-2	12i3.1.1.	Summary of Sprinkler Requirements

**SECTION 1200.0. SCOPE**

The provisions of this article shall control the installation of fire alarm and fire communication systems and fire-extinguishing service equipment in all buildings and structures when specified or required by this Code. All electrical equipment and the details of wiring for fire-extinguishing installations shall comply with the provisions of the Massachusetts Electrical Code and the National Electric Code. The execution of the detail requirements shall be regulated by the approved rules and reference standards listed in Reference Standard RS-12. The provisions of the Massachusetts Code for the Installation of Gas Appliances and Gas Piping shall govern where applicable.

**1200.1. Approved Devices.**—The building official may accept the label or listing in the publications of tests of inspected fire protection equipment and materials of the Underwriters' Laboratories, Inc., or other accredited testing laboratories. When installed in accordance with the limitations of the approval, such systems, devices and equipment shall be deemed to comply with the requirements of this article for the purpose specified.

**1200.2. Auxiliary Equipment.**—Where required by this article or by the provisions of article 4 for special uses and occupancies, readily available auxiliary, first-aid and fire-extinguishing equipment, including hand hose, water barrels, buckets, hand fire extinguishers, chemical engines, axes, hooks, ladders and

other appliances and tools for controlling and fighting fires shall be installed as herein required.

**1200.3. Tests.**—All required tests shall be conducted by and at the expense of the owner or his representative unless otherwise directed by the building official.

## **SECTION 1200.1. DEFINITIONS**

For definitions to be used in the interpretation of this article see section 201.0.

## **SECTION 1202.0. PLANS AND SPECIFICATIONS**

Before any standpipe or sprinkler equipment is installed on existing equipment which involves ten (10) or more sprinkler heads in any one fire area or on any one floor is remodeled, or before the installation or extension of any interior fire alarm signal system, a preliminary set of plans, drawn to suitable scale, shall be filed with the building official with specifications in sufficient detail showing essential features of the construction, heights of stories, location, size and arrangement of all required piping and accessories for each proposed standpipe fire line and sprinkler installation, and layout and wiring of the fire alarm signal system. Application for permit must be submitted and permit obtained as required under Article 1, Part I.

**1202.1. Standpipe Fire Lines.**—Plans for the standpipe installation shall show the size and location of feed lines, risers, connections and valves, size and location of siamese connections, tanks and pumps, hose stations and length of hose, stairways, stair sections and all subdividing partitions and walls.

**1202.2. Sprinkler Systems.**—Plans for the sprinkler installation shall show the location and capacity of water supply; connecting piping; feed lines and risers; all gate, check, alarm and dry-pipe valves; location and number of all heads; location and number of all actuating devices; and standpipe fire lines, if any.

**1202.3. Interior Fire Alarms.**—Plans for the interior fire alarm signal system shall show location and number of all sending stations and signals with specifications of the type, construction, and operation of the system.

**1202.4. Approved Plans.**—After acceptance of the preliminary plans, three (3) final sets of plans shall be filed for final approval of every installation of standpipe fire line, sprinkler and fire alarm signal system.

**SECTION 1203.0. ACCEPTANCE TESTS**

Before final approval and acceptance of fire-extinguishing equipment in any building, pier, wharf or other structure, the installation shall be subjected to the test prescribed herein or in the approved rules. It shall be unlawful to cover up or permanently conceal piping, wiring and accessory devices in any portion of a newly constructed system until it has been tested and approved.

**1203.1. Standpipe Tests.**—Upon completion of a standpipe installation and at least every five (5) years thereafter, every standpipe fire line shall be tested for static pressure and flow, including the top and bottom outlets. Advance notification of tests and inspections required by this section shall be given to the building official.

**1203.1.1. Representation at Test.**—Tests required by this section shall be conducted in the presence of the building official or his authorized representative, or in lieu thereof, the building official may accept a signed statement of an architect or engineer, whose name is submitted with the advance notification, declaring that he has witnessed the tests and that the standpipe system meets the requirements of this code. If a representative of the building official does not appear within two (2) days after receipt of such report by the building official, the report shall be deemed to be accepted by the building official.

**1203.1.2. Testing Equipment Required.**—All equipment, material, and labor required for testing a system or part thereof shall be furnished by, and at the expense of, the person responsible for installing the work.

**1203.1.3. Pressure Test.**—The test shall demonstrate that the system except hose will sustain a hydrostatic pressure of not less than two hundred fifty (250) pounds per square inch for two hours at ground level.

**1203.1.4. Periodic Check Tests.**—The periodic tests shall demonstrate the suitability of the system for fire department use.

**1203.1.5. Temporary Construction Standpipes.**—The feed mains, risers, interconnections and branch lines of temporary standpipes required under the provisions of article 13 in structures under erection shall be maintained water-tight when work is not being done on the system.

**1203.2. Sprinkler Tests.**—Sprinkler tests shall be conducted in accordance with the requirements of Section 1213.6.

**1203.2.1. Wet Pipe Systems.**—Automatic wet pipe systems shall be subjected to a hydrostatic pressure test for two (2) hours duration of not less than two hundred (200) pounds per square inch in every part of the installation exclusive of water supply tanks, or at fifty (50) pounds per square inch in excess of the normal pressure when the normal pressure is in excess of one hundred and fifty (150) pounds per square inch.

**1203.2.2. Automatic Dry Pipe Systems.**—Automatic dry pipe systems shall be tested to forty (40) pounds per square inch air pressure for twenty-four (24) hours duration with a maximum permissible pressure loss of two (2) pounds per square inch.

**1203.2.3. Pressure Tanks.**—Pressure tanks shall be tested to a pressure of one and one-half (1-1/2) times the working pressure.

**1203.3. Fire Alarm Tests.**—Upon completion of a fire alarm system, the installation shall be subjected to a test to demonstrate its efficiency of operation. All connections and wiring, with signal devices disconnected, shall develop an insulation resistance of not less than one (1) megohm.

**1203.4. Pump Tests.**—Fire pumps shall be tested at the factory, and a certified test curve shall be furnished with each pump. Pumps shall be tested after installation to ascertain that the pump is supplying its rated capacity at the highest required hose outlet or through the roof manifold. The test shall be performed as follows:

- a. At least fifty (50) feet of approved two-and-a-half (2-1/2) inch rubber lined hose equipped with a one-and-an-eighth (1-1/8) inch nozzle shall be connected to the highest two-and-a-half (2-1/2) inch hose outlet valve. One of these assemblies shall be connected in parallel for each two hundred and fifty (250) gpm of rated pump capacity.
- b. The nozzle or nozzles of the hose assembly shall discharge at, or above, the highest required hose outlet or through a manifold.
- c. Pilot tube gage readings shall be taken at each nozzle to determine that the required pump capacity is being discharged.
- d. For manually operated fire pumps, the suction and discharge pressures shall be recorded for each step or pump speed. The pump rpm electrical current, and voltage readings shall be recorded with the specific discharge pressure for each supply condition.

- e. Automatic fire pumps shall be tested to ascertain that all of the automatic controls are in good working order.
- f. All of the above readings shall be noted on the required standpipe diagram or a framed chart, which shall be mounted in a visible location near the pump control panel.
- g. When pumps are supplied by two (2) independent services, the test shall be conducted from each service independent of the other and, in addition, with both services supplying the pump.

**1203.5. Test Equipment for Fire Pumps.**—For every fire pump installation, there shall be provided for test purposes at least three (3) fifty (50) foot lengths of approved two-and-a-half (2-1/2) inch rubber lined fire hose. Hose shall be hung in the pump room or other convenient location. Three (3) two-and-a-half (2-1/2) inch by one-and-an-eighth (1-1/8) inch nozzles, three (3) spanner wrenches, and twelve (12) washers shall be stored with the required hose.

## **SECTION 1204.0. PERIODIC INSPECTIONS AND TESTS**

**1204.1. Inspections.**—Inspections and field tests of fire-extinguishing equipment shall be made by the owner or his authorized representative, as herein required to enforce the maintenance of all service equipment in operating condition. Personnel conducting tests shall be approved by the building official.

**1204.2. Maintenance and Test Records.**—All fire-fighting and fire-extinguishing service equipment and appliances, including valves, hose, tools and accessories shall be maintained readily available and in good working order at all times for immediate use of the occupants of the building and the fire department. Records of required inspections and tests shall be available for examination by or filed with the building official as he may direct.

**1204.3. Test Expense.**—All tests shall be conducted at the owner's risk and expense and not less than forty-eight (48) hours' notice shall be given to the municipal official having jurisdiction before any test is made.

**1204.4. Periodic Standpipe Tests.**

**1204.4.1. Flow Tests.**—In buildings and structures exceeding seven (7) stories or eighty-five (85) feet in height, flow tests shall be made at intervals of not more than two (2) years with at least fifty (50) pounds pressure at the topmost hose outlet, with one hose stream flowing.

**1204.4.2. Fire Pumps.**—Fire pumps shall be operated weekly to insure that the equipment is in good operating condition. Records of these tests shall be maintained on the premises by the certified operator and shall be available for inspection and approval.

**1204.5. Periodic Automatic Sprinkler Tests.**

**1204.5.1. Periodic Check.**—All automatic sprinkler systems shall be inspected to observe whether all rooms and spaces are equipped with required sprinklers and that all sprinklers are unobstructed by storage or by the erection of partitions or other structural features which prevent free operation of the system.

**1204.5.2. Fire Pumps.**—Fire pumps shall be operated weekly and records maintained for inspection and approval as required in section 1204.4.2.

**1204.5.3. Free Flow.**—The test pipe at the top of the system shall be operated at each inspection to determine that there is free flow of water at good pressure; and the drains at the base of risers shall be opened and observed for volume of water flow.

**1204.5.4. Supervisory Service.**—When systems which are connected through a central supervisory station or directly to the fire department are tested, notification shall be given to the municipal officials having jurisdiction before the tests are made.

**1204.6. Periodic Open Sprinkler Tests.**—All exterior and interior water curtains or other open sprinkler equipment shall be inspected at least once each year. Exterior systems shall be tested during warm weather.

**1204.7. Periodic Interior Fire Alarm Tests.**

**1204.7.1. Monthly Tests.**—All interior fire alarm signal systems and sending stations shall be tested monthly by the person in charge to insure normal operating conditions. All sending devices shall be reset or rewound when required after each use.

**1204.7.2. Test Records.**—A complete written record of the monthly tests shall be kept by the person in charge and shall be filed with the building official if required by him.

**SECTION 1205.0. MAINTENANCE**

**1205.1. Responsibility.**—The owner of every building and structure shall be responsible for the care and maintenance of all fire-extinguishing equipment and devices to insure the safety and welfare of the occupants. When installations of required automatic extinguishing equipment or fire alarm signal systems are interrupted for repairs or other necessary reasons, the owner shall immediately advise the fire official and shall diligently prosecute the restoration of the protection.

**1205.2. Maintenance of Standpipes.**

**1205.2.1. Tank Supplies.**—All supply tanks shall be maintained at proper water level and air pressure.

**1205.2.2. Valves.**—Valves at hose stations shall be examined for tightness. Valves at automatic sources of supply shall be kept open.

**1205.2.3. Hose.**—Fire hose shall be maintained in good condition and properly arranged on the hose racks. When required, the gaskets shall be replaced in hose valve couplings and nozzles.

**1205.3. Maintenance of Sprinklers.**

**1205.3.1. Open Valves.**—The supply valve shall be kept open and the sprinkler system shall be maintained in service at all times. After alterations, repairs, or emergencies, special inspections shall be made to insure that valves are properly serviced in the open position and the system in operating condition.

**1205.3.2. Corrosion.**—Piping and heads shall be protected from corrosion, unwarranted loading and mechanical injury.

**1205.3.3. Supervisory Service.**—Where central station supervisory service or fire department connection is maintained, immediate notification shall be given to the fire official before operating any supply valve or disturbing the system in any manner.

**1205.3.4. Dry Pipe Systems.**—All water supplies and the air pressure in dry pipe systems and pressure tanks shall be maintained in accordance with the requirements of the system.

**1205.3.5. Fire Pumps.**—Fire pumps shall be operated weekly until water is discharged freely from the relief valve, and records kept as required in section 1204.4.2.

**1205.3.6. Spare Heads.**—A sprinkler wrench and not less than six (6) spare sprinkler heads shall be available on the premises in a readily accessible and plainly identified place to replace fused or damaged equipment.

#### **1205.4. Maintenance of Fire Alarms.**

**1205.4.1. Notice of Defective System.**—When the fire alarm system becomes inoperative, the owner or his designated representative in charge shall notify all occupants and shall take immediate steps to restore proper working conditions. While out of order, all fire alarm stations shall be clearly tagged to indicate the system is not working.

**1205.4.2. Notice to Fire Officials.**—If the operating current of any fire alarm system is disconnected for emergency reasons, the responsible person in charge shall notify the fire official in advance of such disconnection, stating the reasons therefor.

**1205.4.3. Spare Parts.**—When break-glass type fire alarm boxes are employed, at least one (1) extra glass shall be maintained on the premises for each twenty (20) stations of the system.

### **SECTION 1206.0. EXISTING BUILDINGS AND FIRE SERVICE EQUIPMENT**

**1206.1. Existing Standpipes.**—Standpipe fire lines heretofore approved shall not be required to be altered to conform to the provisions of this article except when the building is extended in height or in area, or the occupancy is changed to a use requiring superior protection; except that the following minimum requirements shall apply to all installations:

**1206.1.1. Water Supply.**—There shall be a reserve of twenty-five hundred (2500) gallons of water in a gravity tank for exclusive use of the standpipes; or the water supply shall meet the requirements of Section 1208.1.

**1206.1.2. Gravity Tank.**—The gravity tank shall be fed by direct city water connection at a rate of not less than forty-five (45) gallons per minute or by booster of equal capacity; and the bottom of the tank shall be located at least eleven feet six inches (11'6") above the highest hose outlet under the main roof.

**1206.1.3. Hose and Hose Valves.**—Hose and hose valves shall be in good serviceable condition. Hose valve wheel handles shall be within five feet (5'0") of the floor or stair landings or the wheel handle may be within two feet (2'0") horizontally from a stair tread and no more than five feet (5'0") vertically above the tread.

**1206.1.4. Nozzles.**—A five-eighths (5/8) inch smooth bore nozzle with two-and-a-half (2-1/2) inch hose shall be provided where the hydrostatic pressure at the hose valve is less than ten (10) psig.



**1206.1.5. Protection from Freezing.**—All parts of the standpipe system that are exposed to freezing shall be protected in accordance with the requirements of section 1207.8.6.

**1206.1.6. Pressure Reducing Valves.**—Pressure reducing valves shall be provided as required by section 1207.7.4.

**1206.1.7. Drip Valves.**—Drip valves shall be provided between the siamese connection and the check valve.

**1206.2. Existing Sprinklers.**—Sprinkler systems and devices heretofore approved shall not be required to conform to the provisions of this article except when the fire hazard due to construction and use of the building is increased, or when substantial additions are made to the building or when additional protection is deemed necessary for the safety of the occupants.

**1206.2.1. Voluntary Protection.**—Existing sprinkler systems not required by this Code which have been installed voluntarily need not conform to the provisions of this article except that the siamese hose connection shall be maintained as directed by the fire official.

**1206.2.2. Communicating Buildings.**—When a completely sprinklered building communicates with another not so equipped, the communicating openings shall be provided with an opening protective on both sides of the wall having a combined fire-resistance rating not less than required by table 9-2 in section 902, and section 908 for fire wall openings.

**1206.2.3. Water Supply.**—The service of existing systems shall be of sufficient size to operate the largest number of sprinklers in one (1) fire area except that the building official may accept systems in buildings of low fire hazard when the supply is adequate to furnish at least ten (10) sprinkler heads, and the supply line is at least one and one-half (1-1/2) inches in diameter.

**1206.3. Existing Fire Alarms.**—Fire alarm signal systems heretofore installed in buildings and structures in accordance with the rules then in force shall be accepted so long as they are maintained in good working order satisfactory to the fire official.

## **SECTION 1207.0. STANDPIPE REQUIREMENTS**

**1207.1. When Required.**—

a. Wet standpipe systems shall be installed:

1. In all buildings or portions thereof exceeding six (6) stories or seventy (70) feet in height.

2. In all portions of buildings two or more stories in height that have a net floor area of 10,000 square feet or more on any floor.
- b. Where standpipes are required by the height and area limitations of a. above, a nonautomatic or automatic dry standpipe system may be installed, in lieu of the wet standpipe, in open parking structures.
- c. A standpipe system shall be installed in all buildings exceeding three (3) stories in height that have an area exceeding 7,500 square feet on any floor and where a standpipe system is not otherwise required by the provisions of this article. A nonautomatic or automatic dry system may be used in lieu of the wet standpipe.

**1207.1.1. Exemption.**—The following buildings shall be exempt from the provisions of 1207.1 above:

- a. Buildings classified in occupancy groups F, H, and L that do not exceed two (2) stories or thirty (30) feet in height or do not exceed an area of 20,000 square feet on any floor and are provided with hand or portable fire extinguishers as required by the building official.
- b. Buildings classified in occupancy groups E, F, H, and L that require a wet standpipe as provided in 1207.1.a.2. above but not exceeding six (6) stories or seventy feet (70) in height and that are equipped throughout with an automatic wet or dry sprinkler system connected to a central supervisory station, and such system complies with the provision of this article.

**1207.1.2. Signal System.**—Standpipe signal systems shall be provided in accordance with section 1217.2.

**1207.1.3. Standard for Installation of Standpipe System.**—The installation, components, and types of standpipe systems shall be in accordance with reference standard RS 12-1.

**1207.2. Number of Standpipe Risers Required.**—The number of standpipe risers shall be such that every point of every floor can be reached by a twenty (20) foot stream from a nozzle attached to not more than one hundred and twenty-five (125) feet of hose connected to a riser outlet valve.

**1207.2.1. Location of Standpipe Risers.**—Standpipe risers and two-and-a-half (2-1/2) inch angle hose valves shall be located within stairway enclosures. When stairway enclosures are not available within the distance limitations of section 1207.2, the standpipe risers and two-and-a-half (2-1/2) inch angle hose

valves shall be located as near to the enclosure as practicable, subject to the approval of the building official. A metal sign with one (1) inch lettering indicating the location of the outlet shall be provided in the stair enclosure on each floor where the riser is not located in the enclosure. No standpipe riser shall be placed in any shaft containing a gas or fuel pipeline.

**1207.2.2. Standpipe Clearance.**—No standpipe, outlet, or valve shall project within the width required for a stairway as an exit.

**1207.3. Omission of Standpipe Service.**—Standpipe protection shall be omitted from transformer vaults, high-tension switchboard rooms, and other locations where the use of hose streams would be hazardous. Any space or room that houses equipment of such nature that the use of water would be ineffective in fighting the fire, or would be hazardous, shall have a conspicuous metal sign on each door opening on such space or room stating the nature of the use and the warning: "Use No Water".

**1207.4. Size of Standpipe Risers.**—The size of standpipe risers shall be in accordance with Table 12-1.

**1207.4.1. Table 12-1 Size of Standpipe Risers**

Height*	Minimum Riser Size Required (I.P.S.)
100 feet or less	4 inches
Greater than 100 feet	6 inches

\*The height shall be that of the individual riser to the highest hose outlet (not including manifold outlets) from the level of the entrance floor at street level at which the riser begins.

**1207.5. Standpipe Systems in Structures Being Erected or Demolished.**—During construction or demolition of any structure for which a standpipe system is required, provision shall be made for the use of such standpipe by the fire department in accordance with the provisions of Section 1319.0. and this article. Temporary risers shall be at least four (4) inches in diameter for structures less than one hundred (100) feet high and at least six (6) inches in diameter for structures one hundred (100) feet high or more. There shall be as many risers as will be, or were, required for the permanent system. Each such riser shall be connected to a cross connection that is supplied through siamese hose connections at the street level, and shall be equipped on each floor with a two-and-a-half (2-1/2) inch hose outlet valve. The installations shall be made so that each riser, cross-connection, and branch line can be plugged or capped when work is not being done on the system. The location of the siamese hose

connection shall be placarded, kept free from obstruction, and identified by a red light.

**1207.6. Cross Connections.**—Standpipe systems that include more than one (1) riser shall have all risers cross-connected at, or below, the street entrance floor level, except as otherwise provided in this section. Where there is no cellar, cross connections may be hung from the ceiling of the lowest story. Cross connections shall be at least as large as the largest riser supplied by the cross connection. However, when supplying two (2), but not more than four (4) inch risers, the cross connection shall not be less than five (5) inches. The cross connection shall not be less than six (6) inches for all other riser combinations. Each riser shall be equipped with an o.s. and y. valve to permit individual risers to be taken out of service if damaged or broken without interrupting the water supply to other risers.

**1207.6.1. Standpipe Feeders.**—Each siamese connection shall be connected to a riser or to a cross connection connecting other siamese hose connections or risers. The pipe from the siamese to the riser or cross connection shall be five (5) inches i.p.s., except that a four (4) inch pipe shall be sufficient when such pipe supplies a single four (4) inch riser system. The pipe from the siamese connection shall be run as directly as practicable to the riser or cross connection when the automatic supply is from a city main or a yard hydrant system, a two-and-one-half (2-1/2) inch valved and threaded hose outlet shall be provided to enable the system to be drained.

**1207.6.2. Zoned System.**—Standpipe systems in buildings required by the provisions of section 1208.0. to have one or more zones shall be so designed and installed that the risers supplied from each zone will be cross-connected below, or in, the story of the lowest hose outlets from the water source in each zone. Horizontal intermediate check valves shall be installed in the run of each riser continuing into a higher zone in such manner as to permit all upper zones of the system to be fed through one riser from the zone below and to prevent any lower zone of the system from being supplied from a zone above. Risers supplied by an upper level cross connection shall be provided with manual control valves or remote control valves, so arranged that risers supplied by the upper level cross connections may independently be shut off from the tank supplies.

**1207.6.3. Maximum Pressures.**—The standpipe system shall be zoned by the use of gravity tanks, automatic fire pumps, pressure tanks, and street pressure so that the maximum pressure at the inlet of any hose valve in the zone does not exceed one hundred and sixty (160) psig.

**1207.7. Hose Stations.**

**1207.7.1. Hose Outlet Valves.**—

- a. At the riser on each floor served by the riser and on the entrance floor above the riser control valve, a two and one-half (2-1/2) inch hose outlet valve shall be provided for fire department use. Such hose outlet valve shall be readily accessible from a stairway landing or from a floor, and shall be located between five (5) feet and six (6) feet above the landing or floor.
- b. At the top of the highest riser, there shall be provided above the main roof level, a three-way manifold equipped with three (3) two and one-half (2-1/2) inch hose valves with hose valve caps. Where the manifold is located other than within a heated stair enclosure or bulkhead, the control valve shall be located in a horizontal run of piping below the roof.

**1207.7.2. Location.**—Hose stations shall be located at the standpipe risers on each floor served by the riser located either within a stair enclosure or adjacent to the entrance to such enclosure as provided in section 1207.2.1. When the hose station is located outside the stair enclosure and the riser is within the stair enclosure, it shall be known as and referred to as “Auxiliary Hose Station.”

- a. When auxiliary hose stations are installed, the required two and one-half (2-1/2) inch hose valve at the riser shall be installed and the valve shall be equipped with a cap fastened to the valve with a chain.
- b. Hose stations shall be located so that every point in the floor area served by the hose station is within twenty (20) feet of the end of the hose nozzle with the hose in its extended position. The maximum length of hose that shall be permitted at any hose station is one hundred and twenty-five (125) feet.

**1207.7.3. Hose.**—Each hose station shall have the required length of one and one-half (1-1/2) inch diameter hose equipped with a one-half (1/2) inch nozzle and couplings conforming to the Boston Fire Department standards and hung in an approved rack or cabinet.

- a. Hose lines shall be made up of fifty (50) foot factory coupled hose except that required hose lengths of less than fifty (50) feet shall be in one section of the required length. Only one length less than fifty (50) feet will be permitted where hose length is not of equal fifty (50) foot increments, and no length shall be less than twenty-five (25) feet.

**1207.7.4. Pressure Reducing Valves.**—When the normal hydrostatic pressure at a two and one-half (2-1/2) inch hose outlet valve exceeds fifty-five (55) psig, each valve shall be equipped with an adjustable type pressure reducer so that the pressure on the down-stream side will not exceed fifty (50) psig when the discharge is at the rate of two hundred (200) gpm from a one (1) inch orifice nozzle attached to one hundred (100) feet of two and one-half (2-1/2) inch unlined hose.

- a. At one and one-half (1-1/2) inch hose stations, an adjustable type of pressure reducer shall be provided on each hose outlet valve where the hydrostatic pressure exceeds eighty-five (85) psig and shall be so adjusted that the pressure on the downstream side will not exceed eighty (80) psig when seventy (70) gpm is discharged from a one-half (1/2) inch orifice nozzle attached to the length of hose to be provided at the hose station.
- b. The pressure reducing valve shall be permanently marked with the address of the premises in which it is installed and with the floor location and the setting for the location at which it is to be used.

**1207.8. Fire Department Connection.**

**1207.8.1. Location.**—Every standpipe shall have a fire department connection in an exterior wall of the building, fronting on a street or public space as follows:

- a. One (1) siamese connection shall be provided for each three hundred (300) feet of exterior building wall or fraction thereof facing upon each street or public space.
- b. Where buildings face upon two (2) parallel streets or public spaces without intersecting street or public space, one (1) siamese shall be provided for each three hundred (300) feet of exterior building wall or fraction thereof facing upon each such parallel street or public space.
- c. Where a building faces upon two (2) intersecting streets or public spaces and the total length of the exterior building walls facing upon such streets or public spaces

does not exceed three hundred (300) feet only one (1) siamese connection need be installed provided the siamese connection is located within fifteen (15) feet of the corner and on the longer street.

- d. Where a building faces on three (3) streets or public spaces, one siamese connection shall be provided for for each three hundred (300) feet of building wall or fraction thereof facing upon such streets or public spaces, provided that at least one (1) siamese connection is installed on each of the parallel streets or public spaces, and further provided that the siamese connections shall be located so that the distance between them does not exceed three hundred (300) feet.
- e. Where a building faces upon four (4) streets or public spaces, at least one (1) siamese connection shall be provided on each street front or public space; however, only one (1) siamese connection need be provided at the corner of two (2) intersecting streets or public spaces if the siamese connection is located within fifteen (15) feet of the corner and on the longer street or public space, and if the distances between siamese connections, in all cases, does not exceed three hundred (300) feet.
- f. In any case where the exterior building walls of a building facing a street or public space is obstructed in part by another building, one (1) siamese shall be provided for each clear three hundred (300) feet of exterior building wall or fraction thereof facing upon such street or public space.

**1207.8.2. Height.**—The fire department connection shall be constructed of approved corrosion-resistive metal and shall be installed not less than eighteen (18) inches nor more than thirty-six (36) inches above the grade.

**1207.8.3. Projection.**—The fire department connection shall not project beyond the street lot line or legal building line.

**1207.8.4. Hose Coupling.**—The fire department connection shall have two (2) couplings and if it serves two (2) or more stand-pipes, shall have three (3) couplings of not less than two and one-half (2-1/2) inches inside diameter threaded to receive standard City of Boston fire hose, and protected by approved caps. All hose threads in the fire department connection shall be uniform with that used by the municipal fire department.

**1207.8.5. Identification.**—The fire department connection shall be suitably marked with raised letters not less than one (1) inch high reading “TO STANDPIPE”, or otherwise identified for dry standpipes, automatic or open sprinkler systems as provided in sections 1209.3 and 1213.4.

**1207.8.6. Protection of Standpipe System.**—All parts of the standpipe systems that may be exposed to frost shall be protected from freezing by the following:

- a. The piping shall be frostproofed with insulation having a thermal conductance of 0.1 Btu/hr. per square foot of surface per degree F at a mean temperature of 70 to 75 degrees F. Insulation shall be protected to prevent water infiltration, and when exposed to the weather the insulation shall be covered with a forty-five (45) pound roofing felt jacket or equivalent. Steam or electric tracers may be used in conjunction with the insulation.
- b. Tanks subject to freezing temperatures shall be protected.

## **SECTION 1208.0. STANDPIPE WATER SUPPLIES**

**1208.1. Primary Water Supply for Standpipe Systems.**—Every standpipe system except nonautomatic dry standpipe systems shall have a primary water supply available at all times at every hose outlet, or made available automatically when the hose valve at any outlet is opened. Such primary water supply may be from one or more gravity tanks, from a pressure tank or tanks, from a direct connection to a city water main, from a connection to a private water main, or from an automatic fire pump.

**1208.1.1. Construction and Support of Tanks.**—Tanks for the standpipe system shall be constructed and supported in accordance with the provisions of Article 17 and reference standard RS 12-3, and applicable provisions of Articles 7 and 8 for loads and structural work.

**1208.2. Method of Providing Water Supply for Standpipe Systems.**—Combinations of two or more of the following methods shall be used. In using such combinations, the siamese connections shall be considered as a source of supply.

**1208.2.1. Direct Connection to City Water Main.**—Standpipes may be connected directly to the city water system provided one of the following conditions is met:

- a. A statement furnished by the water department indicates



a pressure in the street main that is capable of maintaining a static pressure of at least thirty-five (35) psig. at the highest hose outlet between the hours of eight (8) a.m. and five (5) p.m. on a normal working day when a street level fire hydrant within two hundred and fifty (250) feet of the building is supplied from the same street main and is discharging at least five hundred (500) gpm through a two and one-half (2-1/2) inch hydrant butt.

- b. For buildings forty (40) feet or less in height with an area of not more than twenty thousand (20,000) square feet per floor, there is a four (4) inch direct connection to the street main that is fed two (2) ways, or there is a four (4) inch direct connection to each of two (2) street mains on two (2) street fronts, so installed that shutting off one service will not interfere with the supply of the other. There shall be sufficient pressure in the street main to maintain a minimum static pressure of thirty-five (35) psig. at the highest required hose outlet, and the water department states that the required street pressure is available.

**1208.2.2. Private Yard Main.**—Standpipes may be connected to a private yard main which meets the conditions required of Direct Connection to City Water Main, section 1208.1.

**1208.2.3. Gravity Tanks.**—Standpipes may be supplied by gravity tanks as follows:

- a. The minimum quantity of water reserved for standpipe service is thirty-five hundred (3,500) gallons in each standpipe zone.
- b. The bottom of the tank shall be at least twenty-five (25) feet above the highest hose outlet that such tank supplies (except the roof manifold) and those hose outlets in a penthouse enclosing mechanical equipment, except as otherwise in e. below.
- c. Each zone of the standpipe system having three (3) risers or more shall have a total fire reserve capacity of five thousand (5,000) gallons or more from one or more gravity tanks for each zone.
- d. Where a group of two (2) or more buildings, connected or separated, is operated under a single control, a single gravity tank having a fire reserve capacity of at least five thousand (5,000) gallons may be accepted as the primary water supply for the several standpipe systems

of such group, provided a dead riser is carried from the bottom of the tank to an underground header or cross connection system, and provided each building unit has a post indicator type control valve outside or an o.s. and y. control valve inside the building at a readily accessible location. The underground cross connection may not cross any public street without the approval of the city departments having jurisdiction.

- e. Usable storage or office space on penthouse floors shall be provided with a riser outlet valve within the distances stated in section 1207.2. In lieu of elevating the bottom of the gravity tank twenty-five (25) feet above these outlets, an automatic fire pump with local supervisory alarms may be installed. The pump shall be capable of delivering two hundred and fifty (250) gpm at a pressure of twenty-five (25) psig above the normal static pressure at the highest outlet supplied by the pump. The pump shall take suction from the gravity tank and be so arranged as to permit the siamese connection and any required manual fire pump to supply these outlets. No more than three (3) stories of any penthouse, or of penthouse and building stories combined, may be supplied by this method.

**1208.2.4. Pressure Tanks.**—Pressure tanks shall be acceptable as the primary supply to the system provided all of the following conditions are met:

- a. A pressure tank, or tanks, so proportioned and located that a pressure of at least fifteen (15) psig will be available at the nozzle of the highest required hose station, exclusive of roof outlets, when all the water has been discharged from the pressure tank.
- b. The storage quantities stated for gravity tanks in 1208.2.3 above are met and an additional volume equivalent to one half (1/2) of the required water storage space is provided for the required air.
- c. An air compressor is provided with suitable automatic control and of sufficient capacity to build up air pressure of at least seventy-five (75) psig in the tank within three (3) hours and to maintain thereafter an air pressure between seventy (70) and eighty (80) psig. The automatic control shall also maintain the proper air-to-water ratio in the pressure tank.

- d. Pressure tanks shall be supplied with water through a fixed pipe, independent of the standpipe riser and at least two (2) inches in size. The water supply and connection shall be capable of supplying the tank at a rate of at least sixty-five (65) gpm without reducing the pressure in the tank. The tank shall have a fixed water level plate on the end opposite the gage glass, or other equivalent indicating device.

**1208.2.5. Automatic Fire Pump.**—An automatic fire pump shall be acceptable as the primary supply to the system provided:

- a. The building is three hundred (300) feet high or less, or if the building is higher than three hundred (300) feet, the automatic fire pump is used only for the lower three hundred (300) feet. The zones above three hundred (300) feet shall be supplied by either a gravity tank conforming to 1208.2.3 above or a pressure tank conforming to 1208.2.4 above and in addition shall be supplied by the manual fire pump required by section 1208.4.
- b. The automatic fire pump supplying the system or section has a capacity of at least five hundred (500) gpm with a discharge pressure of at least twenty-five (25) psig above the normal static pressure at the highest hose outlet within the zone supplied by the pump plus the frictional resistance from the pump to the outlet at a flow of five hundred (500) gpm.
- c. The electrical power to the pump is connected to the street side of the building service switch.

**1208.3. High and Low Risers and Cross Connections in Standpipe Systems.**—When tanks are used for the primary water supply, the standpipe systems may use separate riser systems serving, respectively, low and high parts of the building. Separate gravity tanks or pressure tanks may supply each zone, but in every case the standpipe system shall be so designed that every hose outlet of the entire system can be supplied through the required cross connections from every siamese connection and from every manually operated fire pump located at or below the street level.

**1208.4. Fire Pumps.**—Additional water supply shall be provided for standpipes in buildings over three hundred (300) feet high. The primary water supply to the standpipe system shall be supplemented by one or more manually operated fire pumps as follows:

- a. Standpipe systems in buildings more than three hundred (300) feet high shall have at least one (1) seven hundred and fifty (750) gpm pump or two (2) five hundred (500) gpm pumps. Pumps shall be capable of delivering their rated capacity at a pressure of fifty psig above the normal static pressure determined from the highest hose outlet (except the roof manifold) in the building plus the frictional resistance through the pipe from the pump to the outlet.
- b. Where a group of two or more buildings, whether connected or separated, are operated under a single ownership and one or more buildings exceed three hundred (300) feet in height, one (1) fire pump shall be accepted as the supplemental supply for the group. The pump shall be installed in the building where the maintenance personnel are located, and a metal sign with one (1) inch lettering shall be installed in each building at all of the hose outlets on the entrance floor indicating the location of the fire pump.

**1208.5. Standpipe Pump Rooms and Location.**—Fire pumps shall be installed at the entrance floor level or below, in rooms enclosed by noncombustible construction having a two (2) hour fireresistance rating and that are adequately heated, ventilated, lighted, and drained. The pump room shall have access to the street level by a direct opening to a street or court, or by a passageway or stairway having a fireresistance rating of at least two (2) hours. No person shall install other machinery or mechanical equipment in a fire pump room, unless the building is of construction class 1-A, 1-B, or 1-C. No person shall place or install gas piping or gas consuming devices or any other equipment within any space housing a fire pump such that it would create a hazardous condition.

**1208.6. Power Supply for Standpipe Fire Pumps.**—The type of fire pump and prime mover used in a standpipe system shall be suitable for the required service in a standpipe system provided for fire department use. If the prime mover employs any form of power other than an electric current supplied by a public utility, the use thereof shall be subject to the approval of the building official. Electrical power to the motor shall be taken from the street side of the house service switch.

**1208.7. Combined Use of Fire Pumps for Standpipe and Automatic Sprinkler Systems.**—A fire pump that furnishes the required auxiliary water supply either to a standpipe system or to an automatic sprinkler system shall be accepted as furnishing the corresponding water supply to the other system if such pump is in the same premises, provided that in every such case of combined use, suitable relief and shutoff valves shall be installed so as to prevent the water pressure on the automatic sprinkler system resulting from any required operation of the pump for the standpipe system from becoming greater than one hundred and seventy-five (175) psig.

**1208.8. Direct Connections of Standpipes to the Public Water System.**

**1208.8.1. Control Valve.**—Each service directly supplying a standpipe system or a fire pump shall be equipped with a control valve located under the sidewalk in a flush sidewalk box located within two (2) feet of the street line, or in such other locations as may be approved by the water department. The purpose of each such control valve shall be clearly indicated by the words “Standpipe Supply Control”, cast in the cover of such flush sidewalk box or, in lieu thereof, a metal sign with one (1) inch lettering shall be located on the exterior building wall indicating the use and location of the valve.

**1208.8.2. Water Supply to Standpipe Fire Pumps.**—Any required manual or automatic fire pump shall draw from two (2) independent street water mains in different streets, except that an automatic fire pump may draw from a single street if the valves at the meter and pump are provided with tamper switches that are wired to an approved central station of an operating fire alarm company. Where two (2) services are installed, one (1) service from the street water main shall be run directly to the pump, and the other service may be used for domestic water supply. The connection from the water mains to the pumps shall be at least six (6) inch pipe size and shall be flushed before connection is made to the system. Connections shall be in accordance with article 17.

- a. In the event that two (2) separate and distinct water mains are not available as a supply or the street mains cannot produce the required supply, there shall be provided a suction tank, or tanks, suitably located and of sufficient capacity to furnish the fire pump with at least one half (1/2) hour supply at the rated capacity of such

pump. Suction tanks shall be filled by a six (6) inch connection to the water main, controlled by an automatic ball float valve in the suction tank. A six (6) inch bypass shall be provided so that pumps may be fed directly from the street water main.

- b. When a water service supplies both the domestic service and the manual fire pump, a remote control valve shall be placed on the domestic service connection at the point where such connection is taken from the city supply or service main. Such remote control valve shall be controlled from a point near the pump control panel. In lieu of a remote control valve, a manually operated valve may be installed to shut off the entire domestic water supply to the building, provided such valve is located in the fire pump room and is properly tagged for identification.

**1208.9. Installation of Private Fire Hydrants.**—When buildings are not required to be provided with a standpipe system, at least one (1) entrance to the building shall be located within two hundred and fifty (250) feet of a street hydrant; or, a private hydrant of the same type as the city hydrant connected to the street water main shall be provided within two hundred and fifty (250) feet of entrance. The private hydrant shall be supplied by at least an eight (8) inch pipe, and the domestic water supply may be connected to this private supply provided a shut off valve is installed in a curb box in the domestic supply within six (6) feet of the hydrant shutoff valve.

## **SECTION 1209.0. DRY STANDPIPE FIRE LINES**

**1209.1. Size and Capacity of Dry Standpipes.**—Dry standpipes shall have a minimum diameter of four (4) inches and shall be capable of delivering two hundred and fifty (250) gallons of water per minute simultaneously from each of any three (3) outlets under the operation of one (1) fire engine or pumper; except that in existing installations, the building official may accept a smaller size when deemed adequate by him.

**1209.2. Fire Department Connection for Dry Standpipes.**—Siamese fire department connections shall be provided as herein specified; two-way connection on two and one-half (2-1/2) inch and four (4) inch fire lines; three-way connection on five (5)

inch fire lines; and four-way connection on six (6) inch or larger fire lines.

**1209.3. Identification of Fire Department Connection.**—Fire department connections shall be suitable marked with raised letters at least one (1) inch in height reading “TO DRY STANDPIPE”.

## **SECTION 1210.0. YARD HYDRANTS**

**1210.1. Yard Hydrant Systems Required.**—Outdoor amusement and exhibition places, oil storage plants, lumber yards, trailer camps, industrial parks, and similar occupancies shall have yard hydrants installed so that the entire area may be reached by two hundred and fifty (250) feet of hose from a yard hydrant or a street hydrant. Single hydrant connection shall be at least in six (6) inch i.p.s. Such hydrants shall be directly connected with city water main or private water main, or supplied from gravity tanks or pressure tanks, as provided in this article.

**1210.2. Water Supply.**—Where the area of such enclosure is more than forty thousand (40,000) square feet and where the available city water service is less than that specified in section 1208.2.1, the yard hydrant system shall be supplied as follows:

- a. A gravity tank of at least fifty thousand (50,000) gallon capacity shall be provided and elevated so that the bottom of the tank is at least seventy-five (75) feet above the highest grade elevation and at least twenty-five (25) feet above the highest building in the area supplied by this tank.
- b. In lieu of a. above, there shall be provided a manual fire pump with a capacity of at least one thousand (1,000) gpm, and a suction tank of at least fifty thousand (50,000) gallon capacity. The suction tank shall be supplied through a six (6) inch connection to the city water main controlled by an automatic ball float valve in the suction tank. A bypass shall be provided so that the pump may be fed directly from the city water main.
- c. The pump shall be located in a pump house at the street main side of the area or enclosure.
- d. Suction from a river or well may be permitted by the building official if the required quantity of reasonably clean fresh water may be obtained thereby, subject to the approvals of such other authorities as may have jurisdiction over the primary source of supply.

**1210.3. Hose House.**—The maximum distance between hydrants shall be two hundred and fifty (250) feet. At each yard hydrant, two hundred and fifty (250) feet of rubber lined hose, with a smooth bore one and one-eighth (1-1/8) inch approved play-pipe, shall be placed in a hose house painted red, and the words “FIRE HOSE” in six (6) inch white letters shall be painted on the door.

**1210.4. Monitor Nozzles.**—The approval of the fire department shall be obtained for location of any monitor nozzles that may be required in addition to yard hydrants. Not more than one monitor nozzle with remote control will be required for each forty thousand (40,000) square feet of area or fraction thereof unless, in the fire department’s opinion, an unusual hazard exists.

**1210.5. Connections.**—Standpipes and sprinkler systems may be connected to a yard hydrant system in accordance with the requirements of this article. Yard hydrant systems connected to city water mains shall be provided with post indicator valves located in an accessible position. Post indicator valves shall be locked open and be painted red.

## **SECTION 1211.0. PIPING FOR STANDPIPES**

**1211.1. Piping, Valves and Fittings.**—Connections to systems, material, and equipment to be used shall comply with reference standard RS 12-1. Piping, valves, and fittings shall comply with the provisions of article 17.

## **SECTION 1212.0. PIER AND WHARF PROTECTION**

**1212.1. Fire Area of Piers.**—All piers and wharves shall be subdivided into maximum areas of fifty thousand (50,000) square feet by fire walls complying with the provisions of article 9. The fire walls shall be located at horizontal intervals of not more than three hundred (300) feet and shall extend two (2) feet above the roof and below the low water level when the substructure is of wood or other combustible construction.

**1212.2. Fire Protection of Piers.**—When not protected with an approved two-source automatic sprinkler system, both substructure and superstructure, if of wood or other combustible construction, shall be equipped with an approved standpipe fire line complying with the provisions of this article.



**1212.3. Access Manholes.**—When the floor or substructure is of wood or other combustible construction, two access manholes to the substructure shall be provided in every fire area. Manholes shall be as remote from each other as possible, and shall be suitably marked.

## **SECTION 1213.0. AUTOMATIC SPRINKLER REQUIREMENTS**

**1213.1. Required Sprinklers.**—A system of automatic sprinklers shall be provided in the areas listed in this section and as required in articles 3 through 11. A summary of sprinkler requirements is given in table 12-2, section 1213.1.1.

- a. Buildings classified in high hazard occupancy group A when required by sections 308 and 310.
- b. Spaces classified in high hazard occupancy group A when required by sections 308 and 310.
- c. Buildings classified in storage occupancy group B-1 and B-2 when required by sections 308 and 310.
- d. Spaces classified in storage occupancy group B-1 and B-2 when required by sections 308 and 310.
- e. Spaces classified in mercantile occupancy group C when required by sections 308 and 310.
- f. Unlimited area buildings except as provided in section 309.1.
- g. Buildings and spaces classified in industrial occupancy group D when required by sections 308 and 310.
- h. Places of assembly classified in group F-1a as required by section 418.9.
- i. Corridors and exit passageways of buildings classified in institutional occupancy group H. Patient rooms in H-2 occupancies shall be protected with smoke detectors complying with provisions of section 1213.2.
- j. Regardless of occupancy group classification, any story above grade that cannot be ventilated by at least 20 sq. ft. of free openable area and the first story below grade when it cannot be ventilated by at least 35 sq. ft. of openable area per 10,000 cu. ft. of volume. Such ventilation shall be provided by openable windows or other natural ventilation sources complying with Article 5. All other stories below grade shall be sprinklered. Sprinklers may be omitted in toilets, shower rooms, stairs, and mechanical and electrical equipment rooms.

1. Buildings classified in business occupancy group E shall be exempt from this above grade provision provided all spaces classified in storage occupancy group B-2 exceeding 1,000 sq. ft. in such buildings have been sprinklered in accordance with the requirements of this article.
  2. Fixed windows may be considered as "openable" (may be broken inward) if they are not more than 100 ft. above grade, or 15 ft. below grade; or if they are located within 6 ft. of an accessible roof or setback; or if they are located within 6 ft. of an operable window having at least 3 ft. x 3 ft. openings.
- k. Public Garages.
  - l. Rubbish chutes, laundry chutes, and chutes for similar uses. Sprinklers, protected from damage, shall be provided in accordance with reference standard RS12-2.
  - m. Soiled linen collection and sorting areas.
  - n. Workshops exceeding 100 sq. ft. except in one- and two-family dwellings.
  - o. Refuse collection and disposal areas.
  - p. Drying area of laundries or similar spaces in which two or more clothes drying machines are installed. Sprinklers to be spaced to cover area 5 ft. in front, rear, and sides of machines.
  - q. Sprinklers for cooling towers, where required by section 927.8 shall be either a dry pipe or deluge system designed in accordance with the provisions of reference standard RS 12-4.

Where Required Type of System	Automatic Sources Required	Partial System Permitted	Connection to Domestic Permitted	Alternate Permitted (1213.2)	Siamese Required (1213.4)	Central <sup>a</sup> Station Required (1213.2) (1213.6)	Water <sup>b</sup> Flow Alarm Required (1213.3.1) (P 3721 of RS 12-2)	Automatic Dry Sprinkler Permitted (P 5212 of RS 12-2)	Dry Non-automatic Sprinkler Permitted
High Hazard Building Group A (1213.1.a.) 308 & 310	2	No	No	No	Yes	No	Yes	Yes	No
High Hazard Spaces Group A (1213.1.b.) 308 & 310	1	Yes	No	No	(1213.4.a.3.) If over 36 heads in a fire section	No	Yes <sup>b</sup> If over 36 heads in a fire section	Yes	No
Storage Occupancy Building Group B-1 & B-2 (1213.1.c.) 308 & 310	1	No	No	No	Yes	No	Yes	Yes	No
Storage Occupancy Spaces Group B-1 & B-2 (1213.1.d.) 308 & 310	1	Yes	No	No	(1213.4.a.3.) If over 36 heads in a fire section	No	Yes <sup>b</sup> If over 36 heads in a fire section	Yes	No
Mercantile Occupancy Spaces Group C (1213.1.e.) 308 & 310	2 sources if exceeding 20,000 sq. ft. 1 source if not more than 20,000 sq. ft.	No	No	No	Yes	No	Yes	Yes	No
Unlimited Area Buildings (1213.1.f.) 309.1	1 source if not hazardous occupancy	No	No	No	Yes	No	Yes	Yes	No
Industrial Occupancy Spaces & Buildings Group D (1213.1.g.) 308 & 310	1	No	No	No	Yes	No	Yes	Yes	No
Assembly Occupancy Spaces Group F-1a (1213.1.h.) 418.9	1	Yes	Yes	No	(1213.4.a.3.) If over 36 heads in a fire section	No	Yes <sup>b</sup> If over 36 heads in a fire section	No	No
Institutional Occupancy Group H Corridors and Exit Passageways (1213.1.i.) 1213.2	1	Yes	Yes	No	(1213.4.a.3.) If over 36 heads in a fire section	No	Yes	No	No

Notes: —

<sup>a</sup> Central station supervision required only when booster pump is provided under 1214.5 (or when nonautomatic sprinkler is permitted by the building official.

<sup>b</sup> Water flow alarms required when more than 36 heads are installed in a fire section or fire area.

<sup>c</sup> Only when permitted by the building official.

# 1213.1.1. Table 12-2 Summary of Sprinkler Requirements. — Continued.

Where Required Type of System	Automatic Sources Required	Partial System Permitted	Connection to Domestic Permitted	Alternate Permitted (1213.2)	Siamese Required (1213.4)	Central Station Required (1213.6)	Water Alarm Required (1213.3.1) (P 3721 of RS 12-2)	Automatic Dry Sprinkler Permitted (P 5212 of RS 12-2)	Dry Non-automatic Sprinkler Permitted
Unventilated Areas Above or below grade (1213.1.j.)	1	Yes	Yes	No	(1213.4.a.3.) If over 36 heads in a fire section	Yes If smoke detector is used in lieu of sprinkler	Yes (1214.2.5.h.)	Yes	No
Public Garages Group B-1 & B-2 (1213.1.k.) 415	2 sources if exceeding 70 ft. in height	Yes	No	No	(1213.4.a.3.) If over 36 heads in a fire section	No	Yes <sup>b</sup> If over 36 heads in a fire section	Yes	No
Rubbish, Laundry and Similar Chutes (1213.1.l.)	1	Yes	Yes	No	No	No	No	Yes	No
Soiled Linen Collection and Sorting Areas (1213.1.m.)	1	Yes	Yes	No	(1213.4.a.3.) If over 36 heads in a fire section	Yes If smoke detector is used	Yes (1214.2.5.h.)	Yes	No
Workshops (1213.1.n.)	1	Yes	Yes	Yes	(1213.4.a.3.) If over 36 heads in a fire section	Yes If smoke detector is used in lieu of sprinkler	Yes (1214.2.5.h.)	Yes	No
Refuse Collection and Disposal Areas (1213.1.o.)	1	Yes	Yes In Occupancy Groups E & G	No	(1213.4.a.3.) If over 36 heads in a fire section	Yes If smoke detector is used in lieu of sprinkler	Yes (1214.2.5.h.)	Yes	No
Drying Areas, Laundries or Similar Spaces (1213.1.p.)	1	Yes	Yes In Occupancy Groups E & G	Yes	(1213.4.a.3.) If over 36 heads in a fire section	Yes If smoke detector is used in lieu of sprinkler	Yes (1214.2.5.h.)	No	No
Cooling Towers (1213.1.q.) 927.8	1	No	Yes	No	No	No	Yes	Yes	No

Notes: —

<sup>a</sup> Central station supervision required only when booster pump is provided under 1214.5 or when nonautomatic sprinkler is permitted by the building official.

<sup>b</sup> Water flow alarms required when more than 36 heads are installed in a fire section or fire area.

<sup>c</sup> Only when permitted by the building official.

**1213.2. Smoke Detector Alternate.**—An approved smoke detection alarm system may be used in lieu of sprinklers in those locations described under paragraphs j., m., n., o., p., and q. above. Such smoke detection system shall be of the supervisory type connected to an approved central station.

**1213.3. Standard for Installation of Sprinklers.**—The installation, components, sizing, spacing, location, clearances, position, and type of systems shall be in accordance with reference standard RS 12-2.

**1213.3.1. Sprinkler Alarm System.**—

- a. A sprinkler alarm system shall be provided in accordance with the applicable provisions of reference standard RS 12-2 and RS 12-5.
- b. A sprinkler alarm system shall be required when more than 36 heads are installed in any fire area or section. See table 12-2 for general requirements.

**1213.3.2. Approved Devices.**—No device, valve, pipe, or fitting may be used in a sprinkler system unless such device, valve, pipe or fitting is of a type approved for such use.

**1213.4. Fire Department Connections Required.**—

a. Where required.—

1. Siamese connections shall be provided in accordance with section 1207.8 except as modified hereinafter.
2. In below grade sprinkler systems for garage occupancies involving the storage or repair of motor vehicles, a siamese connection shall be provided within 50 ft. of every exit or entrance used by motor vehicles.
3. Where partial sprinkler protection is required for storage spaces, one siamese connection shall be provided when more than 36 heads are installed in one fire section. Areas subdivided, with the sub-divisions totally enclosed by noncombustible construction having at least a 2 hr. fire resistance rating, shall be considered separate fire sections and the number of heads in the largest section shall determine the necessity for siamese connections.

When partial sprinkler systems are installed to protect entire floor areas, siamese connections shall be provided in accordance with section 1207.8.

In all cases where partial sprinkler protection is provided and siamese connections installed, metal

signs shall be securely fastened to, or above, the siamese connection indicating the area protected. Where the building has two or more frontages, additional metal signs shall be installed indicating the location of the siamese connection.

4. When a sprinkler system supplies a group of buildings siamese connections shall be provided for each building as required by sections 1., 2., and 3. above.
- b. Installation and construction. — The installation and construction of siamese connections shall be the same as required for fire standpipe systems, except that the caps of each automatic sprinkler siamese connection shall be painted green and the entire siamese connection of a nonautomatic sprinkler system shall be painted with aluminum paint.

**1213.4.1. Piping from Siamese Connection.** — Piping from the siamese connection shall be the same size as the riser or trunk main to which it is connected, except that it need not be more than five (5) inches in diameter when supplying larger riser or feed mains. When more than one siamese is required, the piping from each siamese connection need not exceed four (4) inches in diameter.

**1213.5. Protection of Sprinkler System.** —

- a. All parts of an automatic sprinkler system exposed to freezing temperatures shall be protected from freezing in accordance with the provisions of reference standard RS 12-2, or, in lieu thereof, an automatic dry pipe system or a system filled with a nonfreezing, noncombustible solution shall be used, and when a system filled with a nonfreezing solution is used and the system is connected to a potable water supply, it shall be subject to the requirements of the Department of Health and the Department of Public Works.
- b. Sprinkler heads subject to damage shall be protected in accordance with the provisions of reference standard RS 12-2.

**1213.6. Inspection and Tests.** — All inspections and tests of sprinkler systems shall be conducted in accordance with the provisions of section 1203.0. and the following requirements.

- a. Automatic wet and dry systems. — Automatic wet and dry sprinkler systems shall be subjected to a hydrostatic pressure test for a period of one (1) hour at a pressure of

at least one hundred (100) psig at the topmost sprinkler head and at least two hundred (200) psig at the lowest cross connection to the siamese connections.

- b. Automatic dry pipe system.—In addition to the hydrostatic test in a. above, the automatic dry pipe systems shall also be tested to forty (40) psig air pressure for a twenty-four hour period with the pressure loss not to exceed one-and-a-half (1-1/2) psig.
- c. Nonautomatic sprinkler systems.—Nonautomatic sprinkler systems shall be subjected to a hydrostatic pressure test of fifty (50) psig at the topmost sprinkler head, with the test pressure maintained for a period of at least one (1) hour.
- d. Pressure tanks.—Pressure tanks shall be hydrostatically tested to a pressure of at least one-and-a-half (1-1/2) times the working pressure for a period of one (1) hour.
- e. Sprinkler branches and heads supplied from domestic water.—Sprinkler branches and heads shall be tested at the pressure required by this section or at the pressure of the domestic water supply as required by article 15, whichever is greater.
- f. System Performance.—A performance or operation test shall be made on each completed system to determine that all alarms, valves, indicators, pumps, deluge valves, dry pipe valves, and other appurtenances are in good working order.

**1213.6.1. Supervisory Service.**—All components connected to a central station of an approved operating fire alarm company shall be tested to determine that they are in good working order. The test report shall be accompanied by a statement from the central supervisory agency stating that the agency has been retained to provide the required supervision; and when the services of the agency have been terminated, it shall notify the building official in writing.

**1213.6.2. Altered Systems.**—When additions, alterations, or repairs are made to a sprinkler system, the entire system shall be tested as stated in sections 1213.6. and 1213.6.1., except that the pressure at the top of the system need not exceed one hundred (100) psig. In addition, a flow test of at least twenty (20) gpm shall be made from a test connection at the end of the sprinkler header or the section altered or repaired.

**1213.6.3. Pump Tests.**—Pumps shall be tested in accordance with the applicable provisions of sections 1203.4. and 1214.5.

## **SECTION 1214.0. SPRINKLER WATER SUPPLIES**

### **1214.1. Classification of Water Supplies.**

**1214.1.1. Automatic Sources of Water Supply for Sprinkler Systems.**—Automatic sources of water supply for sprinkler systems shall include a gravity tank, pressure tank, automatic fire pump, or direct connection to the public water systems.

**1214.1.2. Auxiliary Sources of Water Supply for Sprinkler Systems.**—Auxiliary sources of water supply for sprinkler systems shall include a manually actuated fire pump or siamese connection.

**1214.1.3. Combination Sprinkler and Standpipe Tank Sources of Water Supply.**—Tanks used to provide the required primary water supply to a standpipe system may also be used as a supply for an automatic sprinkler system.

**1214.1.4. Nonautomatic Sources of Water Supply for Sprinkler Systems.**—Nonautomatic sources of supply for sprinkler systems shall include siamese connections.

**1214.2. Sources of Water Supply for Sprinkler Systems.**—Sprinkler systems shall be provided with water from the following sources.

**1214.2.1. Two Automatic Sources.**—There shall be two automatic sources of water supply provided for sprinklers in:

- a. Buildings classified in occupancy group A.
- b. Buildings classified in occupancy group C when the area on one floor exceeds twenty thousand (20,000) square feet.
- c. Buildings classified in occupancy group F-1a when open heads are required for stages of unlimited size.

**1214.2.2. One Automatic Source.**—At least one (1) automatic source of water supply shall be provided for sprinklers installed in all occupancy groups, except those listed in section 1214.2.1 and except as provided in section 1214.2.3.

**1214.2.3. Domestic Water Source.**—The domestic water supply may be used to supply any sprinklers required under section 1213.1 when installed in buildings classified in occupancy groups E, G, H, and L provided that all the requirements stated in section 1214.2.5. are met.

**1214.2.4. Cooling Towers.**—The domestic water supply may be used to supply water to sprinklers in cooling towers if provision



is made to automatically stop the use of water through the domestic supply lines and provided that all of the requirements stated in section 1214.2.5. are met.

**1214.2.5. Conditions of Domestic Water Supply Use.**—When domestic water is used to supply sprinklers as permitted in section 1214.2.3. and 1214.2.4., all of the following conditions shall be met:

- a. The domestic water supply line from the tank or street supply is at least the size of the sprinkler line and that the capacity available is at least equal to the capacity required for the sprinklers.
- b. The domestic water supply line from the tank or street has the required pressure as provided in section 1214.4.
- c. The domestic water supply line is of nonferrous material except when the domestic water supply is four (4) inches or over.
- d. An o.s. and y. valve or an approved valve having visual indication, sealed open, is installed in the sprinkler supply branch.
- e. The pipe connecting the domestic water supply and the sprinkler control valve is of nonferrous material and not less than twelve (12) inches long.
- f. The number of heads in each fire section does not exceed twenty (20), and no more than ten (10) heads are supplied from any one domestic water riser.
- g. The connection is made at the supply or riser side of any domestic branch control valves.
- h. In connection with the above conditions, the number of fire sections having twenty (20) or fewer heads may be unlimited; and the installation of alarms in branches supplying fire sections shall be at the option of the owner.

**1214.3. Nonautomatic Sprinkler Systems.**—All nonautomatic sprinkler systems shall have siamese connections in accordance with section 1213.4 and malleable iron fittings approved for sprinkler installations.

**1214.3.1. Alarm Required for Nonautomatic Sprinkler System.**—An approved automatic fire alarm with direct connection to a central station of an approved operating fire alarm company shall be installed in the area protected by the sprinkler system.

**1214.4. Direct Connection of Sprinklers to the Public Water System.**—Direct connection of sprinklers to a city water main

shall be acceptable as an automatic water supply, provided the main is capable of maintaining a pressure of at least fifteen (15) psig at the top of the highest sprinkler riser, with five hundred (500) gpm of water flowing from a two-and-a-half (2-1/2) inch hydrant outlet located at the street level within two hundred fifty (250) feet of the building. The hydrant test shall be made between the hours of 8 a.m. and 5 p.m. on a working day. If the pressure found in this test is insufficient to comply with the above requirement, a minimum of twelve (12) psig at the top of the highest sprinkler riser shall be acceptable, provided that all piping in the affected area and supply piping thereto that is four (4) inches and under is increased one pipe size above those sizes required by reference standard RS 12-2. In addition to the fifteen (15) psig or twelve (12) psig requirements, the following requirements shall be met.

- a. The size of each connection shall be as large as that of the main riser and, except in sprinkler systems in multiple dwellings, shall be at least three (3) inches and shall be controlled by an accessible shutoff valve.
- b. The service pipe shall be flushed out thoroughly before connecting to the sprinkler system. A flow sufficient to produce a water velocity of at least five (5) fps shall be used.
- c. Each service shall be equipped, under the sidewalk, with a control valve in a flush sidewalk box located within two (2) feet of the front wall of the building or street line as required by the Department of Public Works. The location of the control valve shall be indicated by a large sign placed on the structure directly opposite the sidewalk flush box, and such sign shall have a white background with one (1) inch red letters reading: "Automatic Sprinkler Shutoff Valve. . . Feet Opposite This Sign." Alternatively, brass, bronze, or other metal sign with one (1) inch letters, raised or counter sunk one-eighth (1/8) inch may be used.
- d. The plans submitted in connection with the permit application shall be accompanied by a statement from the Department of Public Works, stating the size of street main or mains, distance to and size of mains from which it or they are fed, the location of control valves, the static pressure on the hydrant nearest the premises, and the residual pressure in the street main taken on a hy-

drant near the premises when the flow from the nearest hydrant is equal to the flow required to meet the requirements of this section.

**1214.5. Sprinkler Booster Pumps.**— Where the pressure from the city water main is insufficient to comply with the requirements of section 1214.4 but is sufficient to give at least five (5) psig at the highest line of sprinklers as determined by test, an automatic pump installed for the purpose of boosting or increasing the city water pressure in the sprinkler system may be accepted subject to the following requirements:

- a. Pumps shall be of approved centrifugal type, capable of delivering at least two hundred (200) gpm, and shall be capable of supplying twenty-five (25) percent of the heads, in the largest area supplied, at twenty (20) gpm, at a pressure of at least twenty-five (25) psig at the top of the highest sprinkler riser.
- b. Pumps shall be maintained under approved automatic control with closed circuit supervisory attachment. The supervisory attachments shall be directly connected to an office where maintenance personnel are in attendance twenty-four hours a day; or, in lieu thereof, the supervisory attachment may be directly connected to the central station of an approved operating fire alarm company. The supervisory alarm services shall be arranged so as to provide positive indication at an approved central office or sprinkler alarm panel board that the pump has operated or that the source of electrical supply has failed.

**1214.6. Gravity and Pressure Tanks.**— When the requirements of sections 1214.4 and 1214.5 are not met, a pressure or gravity tank shall be used, complying with the provisions of article 17 and reference standard RS 12-3.

**SECTION 1215.0. OMITTED**

**SECTION 1216.0. OMITTED**

**SECTION 1217.0. SPECIAL FIRE PROTECTION**

**1217.1. Standpipe Fireline Telephone and Signaling Systems.**— In every building more than three hundred (300) feet high, a telephone and signaling system shall be provided for fire department use in operating the standpipe system. Such system shall

permit communication by permanent telephones in the pump rooms, on the entrance floor, and in gravity tank rooms communicating with floors, and by means of permanent or portable telephones on each floor near the main standpipe riser. The system shall be a selective ringing, common talking system supplied by a 24-volt direct current power source.

**1217.1.1. Telephone Signals.**—Permanent wall telephones shall be provided with six (6) inch gongs at each instrument. The telephones in the pump room shall be equipped with a loud-speaking receiver so that a voice can be distinctly heard at a distance of at least fifteen (15) feet from the receiver. All other floors shall be provided with jacks, protected by break-glass boxes, or with permanent telephones.

**1217.1.2. Standpipe Telephones.**—At least three (3) portable telephones with jack connections shall be provided for each standpipe installation, unless permanent telephones are installed at every required location. The portable telephones shall be kept in a cabinet located in the main hall of the entrance floor and shall be provided with a lock capable of being opened with a fire department standard key. Such cabinet shall be locked at all times. The panel of the cabinet door shall be conspicuously marked “Portable Telephone for Fire Department Use.”

**1217.1.3. Pilot Light.**—A pilot light shall be provided over the standpipe telephone cabinet in the entrance floor to indicate if the telephone is in use or a receiver is off the hook.

**1217.2. Standpipe Signaling Devices.**—Where required in section 1217.1, manual type individually coded sending stations shall be located in the main corridor of the building or other location meeting the approval of the building official. This system shall be so arranged that a coded signal will be transmitted to the alarm sounding devices. An eight (8) inch gong shall be provided in the pump rooms, in elevator shafts at intervals not exceeding ten (10) floors, and at such other locations selected by the architect or engineer, subject to the approval of the building official. All apparatus used in connection with the signaling system shall be of an approved type and installed as required by the provisions of reference standard RS 12-5 governing the installation of interior fire alarm systems.

**1217.2.1. Strap Key.**—Adjacent to each telephone station and near the main standpipe riser, there shall be provided an approved closed circuit strap key enclosed in a sheet metal box equipped with a paracentric fire department lock and approved

hinges. The strap key shall be connected in series with the box circuit of the signal sending station.

**1217.2.2. Instruction Card.**—A card of instructions shall be placed in the pump room giving code numbers of signaling stations, the pressure obtainable at various speeds of the fire pump motor, and such other information as the building official may direct.

**1217.3. Chemical and Special Extinguishing Systems.**—All buildings and structures and parts thereof designed for uses subject to fires of extreme severity and explosion hazards as provided in article 4 shall be protected with approved automatic extinguishing systems installed and maintained as required by accepted engineering standards.

## **SECTION 1218.0. MANUAL FIRE-EXTINGUISHING EQUIPMENT**

**1218.1. Portable Fire Extinguishers.**—A portable fire extinguisher shall consist of a container holding not less than two and one half (2-1/2) gallons of extinguishing liquid so arranged and equipped that pressure may be generated and the contents discharged through a hose and nozzle; or a portable extinguisher of other type approved as equal thereto by the fire commissioner. The design and construction of portable fire extinguishers shall be approved by the fire commissioner.

**1218.2. Mounting.**—Portable fire extinguishers, where required, shall be mounted in corridors or other approved locations generally visible to the occupants of the building. Where they are placed in cabinets they shall be visible and the doors shall be unlocked or of glass which can be broken to give access to the extinguisher in case of fire.

**1218.3. Charging.**—Portable fire extinguishers shall be discharged and recharged as often as shall be generally required by the fire commissioner for extinguishers of each type, and shall be recharged at once after use.

## **SECTION 1219.0. INTERIOR FIRE ALARM SYSTEMS**

A closed circuit electrically supervised fire alarm signal system shall be installed in all buildings herein designated.

## **1219.1. Buildings Requiring Fire Alarms.**

**1219.1.1. Residential Buildings.**—Hotels, motels, lodging houses, dormitories, bath houses, health clubs, and single room occupancies having more than fifteen (15) sleeping rooms or accommodating more than fifteen (15) lodgers above the first or ground story.

**1219.1.2. Institutional Buildings.**—Public and private hospitals, sanatoriums, nursing homes, homes for the aged, and similar occupancies having more than fifteen (15) rooms or accommodating more than fifteen (15) patients, inmates, or residents above the first or ground story.

**1219.1.3. Nursery Buildings.**—Day care agencies having a board of health permit for the accommodation of more than thirty (30) children. If such day care agency is located at the grade level of the building, the fire alarm system is required only in the premises of the day care agency. If the day care agency is located at other than grade level of the building, an approved fire alarm system shall be provided throughout the building.

**1219.1.4. School Buildings.**—All public schools; also all private schools and university teaching buildings more than one story in height. If a school premise is located at other than a grade level of a building, an approved fire alarm system shall be provided throughout the building.

**1219.1.5. Mercantile Buildings.**—Department stores or retail sales establishments having one or more floors above the street floor to which the public is admitted.

**1219.1.6. Industrial Buildings.**—All factory buildings (occupancy group D) exceeding two (2) stories in height not equipped with an approved automatic sprinkler system, in which more than twenty-five (25) individuals are employed above the first or ground floor shall be equipped with an approved fire alarm system.

**1219.1.7. Business Buildings.**—All office buildings more than six (6) stories or seventy-five (75) feet in height with an occupancy load of more than one hundred (100) above the first floor which are not equipped with an automatic sprinkler system shall be equipped with an approved fire alarm system.

**1219.1.8. High Hazard Use.**—All motion picture studios and film laboratories and similar high hazard uses (occupancy group A) shall be equipped with an approved fire alarm system.

**1219.2. Approvals.**—Equipment and systems shall be made of approved materials, and shall be free from defective workmanship. The requirements of reference standard RS 12-5 shall apply

except as specifically qualified herein. Before any fire alarm system is installed or extended, approval shall be obtained from the building official.

**1219.3. Existing Installations.**—Fire alarm systems heretofore installed in buildings in accordance with the rules then in force shall be accepted as long as they are maintained in good working order.

**1219.4. Classification and General Requirements of Fire Alarm Systems.**—Fire alarms shall be classified as follows and shall meet the following general requirements:

**1219.4.1. Uncoded Closed Circuit Fire Alarm Systems.**—Consisting of manually operated sending stations and audible signaling devices, so arranged that the operation of any station will automatically sound continuously the signaling devices throughout all portions of the building.

**1219.4.2. Master Coded Closed Circuit Fire Alarm Systems.**—Consisting of manually operated pull-lever type sending stations and audible signaling devices, so arranged that the operation of any station will automatically sound the signaling devices giving a common code of signals throughout all portions of the building. The code shall consist of four rounds of a series of single strokes of the signaling devices, each round consisting of “3-3-3-3”.

**1219.4.3. Individually Coded Closed Circuit General Fire Alarm Systems.**—Consisting of manually operated pull-lever type sending stations and audible signaling devices, so arranged that the operation of any station will automatically sound the signaling devices, throughout all portions of the building, for a minimum of four (4) rounds of a distinctive code of signals particular to the station at which the signal has been initiated. The code numbers that are used shall be subject to the approval of the fire commissioner.

**1219.4.4. Individually Coded Closed Circuit Presignal Fire Alarm Systems.**—Consisting of manually operated pull-lever type sending stations and audible signaling devices so arranged that the operation of any station will cause the sound of only the signal devices located in the engine room and basement and other places in the building where the members of a fire brigade work or assemble. The signaling device shall give four rounds of the particular code signal of the station at which the signal has been initiated. Approved equipment shall be provided at each station so that the operation of any station performed

with the aid of a key or plug will sound all of the signal devices located in the building with four rounds of the particular coded signal of the station initiated. The code numbers used shall be subject to the approval of the fire commissioner. The presignal key or plug shall be so designated that it can be readily identified. Presignal type systems will not generally be approved; however, approval may be obtained from the fire commissioner where special type occupancies may warrant such a system.

**1219.4.5. Combination Unit or Zone, and General Alarm Coded Closed Circuit Fire Alarm Systems.**—Consisting of manually operated pull-lever type sending stations and signal devices so arranged that the operation of any station will cause all of the signaling devices in that unit or zone to sound four (4) rounds of the particular coded signal of the station initiated, and simultaneously will cause all of the signaling devices on the general alarm circuit to sound four (4) rounds of the coded signal designating the unit or zone in which the station is located. An approved register and time stamp may be used in connection with this system when approved by the fire commissioner. The register, if of the closed circuit type, shall be operated from a separate closed circuit control board or panel isolated by a barrier from the main control panel in the main fire alarm control cabinet. An approved closed circuit unit annunciator with trouble alarm circuit shall be installed as part of this system when required by the fire commissioner.

**1219.4.6. Special Systems.**—Consisting of the above systems as required, supplemented by special circuits for the operation of other fire alarm or detection devices in the systems, or electric control systems for stopping machinery, closing doors or ventilators, or shutting down fans as may be required by the building official or this Code, or to call the central station of a private operating company of the fire department. Automatic fire detecting systems may be connected to operate an interior fire alarm system when connected thereto by an approved coded transmitter. In no case shall the transmitter be considered to replace the standard approved interior fire alarm station, except where a transmitter has been approved for both purposes. The special control circuits and devices shall be separate and distinct from the fire alarm system but shall be brought into action whenever the fire alarm system is set in operation.



**1219.5. Systems Required for Specific Occupancies.—**

**1219.5.1. One Story Buildings.—**In any type of one-story building where a fire alarm system is required and where the floor area is not more than twenty-five hundred (2,500) square feet, an uncoded closed circuit fire alarm system may be used.

**1219.5.2. Private and Public Schools.—**Master coded systems shall be used in all schools, except that schools having more than fifteen hundred (1,500) students shall have an individually coded system.

**1219.5.3. Factory Buildings.—**An individually coded closed circuit fire alarm system shall be installed except as hereinafter provided. An uncoded circuit fire alarm system may be used in buildings not exceeding two (2) stories in height, having not more than twenty-five hundred (2,500) square feet in area in any one story, and having not more than one hundred (100) persons in a single factory nor more than fifty (50) persons in a multiple tenant factory above the first or ground floor. Special fire alarm signal systems may be designed for use in factory buildings subject to the approval of the fire commissioner.

**1219.5.4. Motion Picture Studios.—**A common coded closed circuit system may be used in a motion picture studio, and in addition, an approved rate-of-rise or other approved thermostatic fire alarm system, with direct connections to a central office of an approved operating fire alarm company or a fire alarm telegraph central station, shall be provided for protecting the open studio door. Also there shall be one or more manual fire alarm boxes, which shall be located so as to be readily accessible from the open studio door.

**1219.5.5. Hospitals, Asylums, and Nursing Homes.—**Where the hospital, asylum, or nursing home consists of one building, an individually coded general alarm system shall be provided, unless permission is obtained from the fire commissioner for the installation of a presignal type system.

Where a hospital, asylum or nursing home consists of two (2) or more buildings serviced by a single fire brigade, a combination unit or zone and a general alarm coded system shall be provided and an approved indicating annunciator installed in each building. When a station signal is initiated, the general alarm signaling devices shall sound in the engine rooms and basements of all the subject buildings, and the unit (or zone) alarm signaling devices shall sound throughout all areas in only the building where the station signal was initiated. The indicating

annunciator in the building where the station signal has been initiated shall indicate by lamp or shutter the particular station from which the signal was initiated.

**1219.5.6. All Other Occupancies.**—Shall be provided with an individually coded closed circuit general fire alarm system when a fire alarm system is required.

**1219.6. Location of Sending Stations and Sounding Devices.**—

**1219.6.1. Location of Sending Stations.**—There shall be at least one fire alarm sending station in each story of any building—at all natural paths of egress to the street. The station shall be installed at a readily accessible location meeting the approval of the fire commissioner. The sending station shall be kept unobstructed at all times. Additional sending stations shall be installed so that no point on any floor is more than one hundred fifty (150) feet from the nearest sending station in buildings of Type 1 construction and one hundred (100) feet in buildings of Type 2 construction. All fire alarm stations shall be installed so that the handle is approximately five feet three inches (5'3") from the floor.

**1219.6.2. Location of Sounding Devices.**—Sounding devices shall be of sufficient number so that the alarm shall be clearly audible to all the occupants of the building. The centerline of all gongs and signaling devices shall be located at least eight (8) feet above the floor except that in locations where ceilings prevent the installation at this height, the centerline of the device shall be located six (6) inches below the ceiling. Approved gongs shall be provided as the sounding devices. Where gongs are not audible, approved horns, chimes, or whistles may be installed subject to the approval of the fire commissioner.

**1219.6.3. Location of Instructions.**—An approved instruction card, properly marked and framed under glass, shall be installed at each fire alarm station. Instruction cards for individually coded systems shall indicate the code designation and location of each sending station in the building.

**1219.6.4. Fastening for Devices.**—All materials and devices used in fire alarm signal systems shall be securely fastened in position. The locations shall be selected by an architect or engineer, subject to the approval of the building official.

**1219.6.5. Mixed Occupancy Buildings.**—Where a building is subdivided by fire divisions, each building section may be treated as a separate building for the purpose of fire alarm signal system installations. One control board may be used, if so arranged

as to operate the signaling devices in each building section independently.

**1219.6.6. Subdivided Occupancy.**—In buildings requiring fire alarm signal systems, and in which parts are occupied by other than factory tenants and in which the fire department has approved the use of a local fire brigade, the building official may accept dual operation systems.

**1219.7. Installation.**—Installation, source of energy, wiring, and other requirements shall comply with reference standard RS 12-5.

**1219.8. Fire Systems Electrical Tests.**—Upon completion of a fire alarm system, and other electrical systems, the installation shall be subjected to a test to demonstrate the efficiency of operation of all the components in the system and to an acceptance test by the fire department.



## REFERENCE STANDARD RS 12 FIRE PROTECTION AND EXTINGUISHING EQUIPMENT

### List of Reference Standards

NFPA No. 13 1969  
Installation of Sprinkler Systems

NFPA No. 14 1969  
Standpipes and Hose Systems

NFPA No. 22 1967  
Water Tanks for Private Fire Protection

NFPA No. 71 1969  
Central Station Protective Signaling Systems

NFPA No. 72A 1967  
Local Protective Signaling Systems

NFPA No. 72B 1967  
Auxiliary Signaling Systems

NFPA No. 72C 1967  
Remote Station Signaling Systems

NFPA No. 72D 1967  
Proprietary Signaling Systems

NFPA No. 214 1968  
Water Cooling Towers

**RS 12-1** NFPA No. 14 1969  
Standpipes and Hose Systems

**RS 12-2** NFPA No. 13 1969  
Installation of Sprinkler Systems  
The minimum recommended standards indicated by the use of the words “desirable”, “should”, “recommended”, etc. in NFPA No. 13, 1969, shall be a mandatory minimum.

- RS 12-3** NFPA No. 22 1967  
Water Tanks for Private Fire Protection
- RS 12-4** NFPA No. 214 1968  
Water Cooling Towers
- RS 12-5** NFPA No. 71 1969  
Central Station Protective Signaling Systems
- NFPA No. 72A 1967  
Local Protective Signaling Systems
- NFPA No. 72B 1967  
Auxiliary Signaling Systems
- NFPA No. 72C 1967  
Remote Station Signaling Systems
- NFPA No. 72D 1967  
Proprietary Signaling Systems

## PRECAUTIONS DURING BUILDING OPERATIONS

1300.0	Scope	1311.0	Storage of Materials
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		1322.0	Sanitation
		1323.0	Disputes

### SECTION 1300.0. SCOPE

The provisions of this article shall apply to all construction operations in connection with the excavation, erection, alteration, repair, removal or demolition of buildings and structures.

**1300.1. Other Laws.**—Nothing herein contained shall be construed to nullify any rules, regulations or statutes of state agencies governing the protection of the public or workmen from health or other hazards involved in manufacturing, mining and other processes and operations which generate toxic gases, dust or other elements dangerous to the respiratory system, eyesight or health.

**1300.2. Combustible and Explosive Hazards.**—The provisions of this Code which apply to the storage, use or transportation of explosives, highly flammable and combustible substances, gases and chemicals shall be construed as supplemental to the requirements of the federal laws, the regulations of the Interstate Commerce Commission and the rules and regulations of the City of Boston.

### SECTION 1301.0. DEFINITIONS

For definitions to be used in the interpretation of this article, see Section 201.

## **SECTION 1302.0. PLANS, SPECIFICATIONS AND SPECIAL PERMITS**

**1302.1. Temporary Construction.**—The design and construction of all sidewalk sheds, truck runways, trestles, foot bridges, guard fences and other similar devices required in the construction operation shall be executed by, or under the supervision of an engineer or an architect who shall cause his seal and signature to be affixed to any drawings or specifications that may be required for the work. All such documents shall be kept at the site for inspection by the building official for the duration of the construction operation.

**1302.2. Special Permits.**—All special licenses and permits for the storage of materials on sidewalks and highways, for the use of water or other public facilities and for the storage and handling of explosives shall be secured from the administrative authorities having jurisdiction. This will usually be the Public Works Department of the City of Boston.

**1302.3. Contractor's Shed.**—Contractor's sheds and offices shall be constructed of metal or other non-combustible material when located within thirty (30) feet of new construction or existing buildings. Fire retardant treated wood may be used when not exposed to the weather. They shall be securely locked during non-working hours, and they shall be removed from premises before a certificate of occupancy shall be issued.

## **SECTION 1303.0. TESTS**

**1303.1. Loading.**—It shall be unlawful to load any structure, temporary support, scaffolding, sidewalk bridge or sidewalk shed or any other device or construction equipment during the construction or demolition of any building or structure in excess of its safe working capacity as provided in article 7 for allowable loads and working stresses.

**1303.2. Unsafe Equipment.**—Whenever any doubt arises as to the structural quality or strength of scaffolding plank or other construction equipment, such material shall be replaced; provided, however, the building official may accept a strength test to two and one-half (2-1/2) times the superimposed live load to which the material or structural member is to be subjected. The member shall sustain the test load without failure.



## **SECTION 1304.0. INSPECTION**

When inspection of any construction operation reveals that any unsafe or illegal conditions exist, the building official shall notify the owner and direct him to take the necessary remedial measures to remove the hazard or violation.

**1304.1. Failure to Comply With Orders.**— Unless the owner so notified proceeds to comply with the orders of the building official within twenty-four (24) hours, the building official shall have full power to correct the unsafe conditions as provided in Part I section 116. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

**1304.2. Unsafe Construction Equipment.**— When the strength and adequacy of any scaffold or other device or construction equipment is in doubt, or when any complaint is made, the building official shall inspect such equipment and shall prohibit its use until tested as required in section 1303.2 or until all danger is removed.

## **SECTION 1305.0. MAINTENANCE**

All construction equipment and safeguards shall be constructed, installed and maintained in a substantial manner and shall be so operated as to insure protection to the workmen engaged thereon and to the general public. It shall be unlawful to remove or render inoperative any structural, fire-protective or sanitary safeguard or device herein required except when necessary for the actual installation and prosecution of the work.

## **SECTION 1306.0. EXISTING BUILDINGS**

**1306.1. Protection.**— All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

**1306.2. Chimney, Soil and Vent Stacks.**— Whenever a new building or structure is erected to greater or less height than an adjoining building, the construction and extension of new or existing chimneys shall conform to the provisions of section 1006.

**1306.3. Adjoining Walls.**— The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. He shall underpin where neces-

sary and support the adjoining building or structure by proper foundations to comply with section 1308.

**1306.3.1. Party Walls.**— Where a party wall is intended to be used by the person causing the excavation to be made, he shall, at his own expense, preserve such party wall from injury and shall support it so that the said party wall shall be safe for the purposes intended.

**1306.3.2. Beam Holes.**— When a structure involving a party wall is being demolished, the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick-up all open beam holes and otherwise maintain the safety and usefulness of the wall.

**1306.3.3. Party Wall Exitways.**— No party wall balcony or horizontal fire exit shall be destroyed unless and until a substitute means of egress has been provided and approved by the building official.

**1306.4. Adjoining Roofs.**— When a new building or demolition of an existing building is being prosecuted at a greater height, the roof, roof outlets and roof structures of adjoining buildings shall be protected against damage with adequate safeguards by the person doing the work.

**1306.5. Unsafe Condition.**— If the person whose duty it shall be under the provisions of this section to preserve or protect any wall, building or structure from injury, shall neglect or fail to do so, the building official may enter on the premises, and make safe such wall, building or other structure as provided in Part I section 116.

## **SECTION 1307.0. PROTECTION OF PUBLIC AND WORKMEN**

Whenever a building or structure is erected, altered, repaired, removed or demolished, the operation shall be conducted in a safe manner and suitable protection for the general public and workmen employed thereon shall be provided.

**1307.1. Fences.**— Every construction operation located five (5) feet or less from the street lot line shall be enclosed with a fence not less than eight (8) feet high to prevent entry of unauthorized persons. When located more than five (5) feet from the street lot line, a fence or other barrier shall be erected when required by the building official. All fences shall be of adequate strength to resist the wind pressure specified in section 716.

**1307.2. Sidewalk Bridge.**—Whenever the ground is excavated under the sidewalk, a sidewalk bridge shall be constructed at least four (4) feet wide, or a protected walkway of equal width shall be erected in the street, provided the required permit for such walkway is obtained from the administrative authority, usually the Department of Public Works of the City of Boston.

**1307.3. Sidewalk Shed.**

**1307.3.1. Within 10 Feet of Street Lot Line.**—When any building or part thereof which is located within ten (10) feet of the street lot line is to be erected or increased in height to exceed thirty-five (35) feet in height, or whenever a building more than thirty-five (35) feet in height within ten (10) feet of the street lot line is to be demolished, a sidewalk shed shall be erected and maintained for the full length of the building on all street fronts for the entire time that work is performed on the exterior of the building.

**1307.3.2. Within 20 Feet of Street Lot Line.**—When the building or part thereof being demolished or erected is located within twenty (20) feet of the street lot line and is more than thirty-five (35) feet in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than twenty (20) feet below the working level.

**1307.3.3. Buildings Higher than Six Stories.**—When the building or part thereof being demolished or erected is more than six (6) stories or seventy (70) feet in height, unless set back from the street lot line a distance more than one-half ( $1/2$ ) its height, a sidewalk shed shall be provided.

**1307.3.4. Walkway.**—An adequately lighted walkway at least four (4) feet wide and seven (7) feet high in the clear shall be maintained under all sidewalk sheds for pedestrians. Where ramps are required, they shall conform to the provisions of this article and section 617. The covering of all walkways shall be solid or overlapping to prevent the passage of dust or debris.

**1307.4. Thrust-Out Platforms.**—The building official may approve thrust-out platforms or other substitute protections in lieu of sidewalk sheds when deemed adequate to insure the public safety. No thrust-out platforms shall be used for the storage of materials. Floor of thrust-out platforms shall be solid or overlapping to prevent the passage of dust or debris. Platforms twenty (20) feet or more above grade shall have guard rails.

**1307.5. Watchman.**—Whenever a building is being demolished, erected or altered, a watchman may be required by the building official to be employed to warn the general public when intermittent hazardous operations are conducted across the sidewalk or walkway.

## **SECTION 1308.0. EXCAVATIONS**

**1308.1. Temporary Support.**—Until provision for permanent support has been made, excavations shall be properly guarded and protected by the persons causing them to be made so as to prevent such excavation from becoming dangerous to life or limb, or to prevent adjoining soil from moving or caving, or to preserve or protect any wall, building, or structure from injury. Where necessary, excavations shall be sheet-piled, braced, or shored, and permanent excavations shall be protected by retaining walls or other permanent structures to prevent movement or caving of the adjoining soil.

**1308.1.1. Examination of Adjoining Property.**—Before any excavation or demolition is undertaken, license to enter upon adjoining property for the purpose of physical examination shall be afforded by the owner and tenants of such adjoining property to the person undertaking such excavation or demolition, prior to the commencement and at reasonable periods during the progress of the work.

**1308.1.2. Notice to the Building Official.**—If the person who causes an excavation to be made or an existing structure to be demolished has reason to believe that an adjoining structure is unsafe, he shall forthwith report in writing to the building official. The building official shall inspect such premises, and if the structure is found unsafe, he shall order it repaired as provided in Part I section 116.

**1308.1.3. Responsibility of Adjoining Owner.**—The person making or causing an excavation to be made shall, before starting the work, give at least one week's notice in writing by registered mail to the owner of each neighboring building or structure the safety of which may be affected. Having received consent to enter a building, structure or premises, he shall make the necessary provisions to protect it structurally and to insure it against damage by the elements which may ensue from such excavation. If license to enter is not afforded, then the adjoining owner shall have the entire responsibility of providing both

temporary and permanent support of his premises at his own expense; and for that purpose, he shall be afforded the license when necessary to enter the property where the excavation is to be made.

**1308.1.4. Excavations for Other than Construction Purposes.**—Excavations made for the purpose of removing soil, earth, sand, gravel, rock or other materials shall be performed in such a manner as will prevent injury to neighboring properties or to the street which adjoins the lot where such materials are excavated, and to safeguard the general public health and welfare.

**1308.2. Permanent Support.**—Whenever an excavation is made below the established grade, the person who causes such excavation to be made if afforded the necessary license to enter the adjoining premises, shall preserve and protect from injury at all times and at his own expense such adjoining structure or premises which may be affected by the excavation. If the necessary license is not afforded, it shall then be the duty of the owner of the adjoining premises to make his building or structure safe by installing proper underpinning or foundations or otherwise; and such owner, if it be necessary for the prosecution of his work shall be granted the necessary license to enter the premises where the excavation or demolition is contemplated.

**1308.3. Unsafe Condition.**—If the person whose duty it shall be under the provisions of this section to guard or protect an excavation, or to prevent adjoining soil from moving or caving, or to preserve or protect any wall, building, or structure from injury, shall neglect or fail so to do, the building official may enter upon the premises, and make safe such excavation, wall, building or other structure as provided in Part I section 116.

## SECTION 1309.0. REGULATION OF LOTS

**1309.1. Grading of Lot.**—When a building has been demolished and no building operation has been projected or approved, the lot shall be levelled to uniform grade by a proper sanitary fill to cover any cellar or foundation hole and any rubble not removed. The lot shall be maintained free from the accumulation of rubbish and all other unsafe or hazardous conditions which endanger the life or health of the public; and provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

**1309.2. Utility Connections.** — All service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the municipal authority having jurisdiction.

## **SECTION 1310.0. RETAINING WALLS AND PARTITION FENCES**

When the adjoining grade is made lower than the existing contour, the person causing an excavation to be made shall erect, when necessary, a retaining wall at his own expense and on his own land. Such wall shall be built to a height sufficient to retain the adjoining earth, shall be properly coped as required in section 872 and shall be provided with a permanent guard-rail or fence not less than four (4) feet in height.

## **SECTION 1311.0. STORAGE OF MATERIALS**

All materials and equipment required in construction operations shall be stored and placed so as not to endanger the public, the workmen or adjoining property.

**1311.1. Design Capacity.** — Materials or equipment stored within the building, or on sidewalks, sheds or scaffolds shall be placed so as not to overload any part of the construction beyond its design capacity, nor interfere with the safe prosecution of the work.

**1311.2. Special Loading.** — Unless the construction is designed for special loading, materials stored on sidewalk sheds and scaffolds shall not exceed one (1) day's supply. All materials shall be piled in an orderly manner and height, to permit removal of individual pieces without endangering the stability of the pile.

**1311.3. Pedestrian Walkways.** — No materials or equipment shall be stored on the street without a permit issued by the City of Boston Department of Public Works. When so stored they shall not unduly interfere with vehicular traffic, or the orderly travel of pedestrians on the highways and streets. The piles shall be arranged to maintain a safe walkway not less than four (4) feet wide, unobstructed for its full length, and adequately lighted at night and at all necessary times for the use of the public.

**1311.4. Obstructions.** — Material and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes,

fire or police alarm boxes, utility boxes, catch basins, or manholes, nor shall they be located within twenty (20) feet of a street intersection, or so placed as to obstruct normal observations of traffic control lights, or to hinder the use of street car loading platforms.

## **SECTION 1312.0. REMOVAL OF WASTE MATERIAL**

No material shall be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection, without wood or metal chutes provided for this purpose and any material which in its removal will cause an excessive amount of dust shall be wet down to prevent the creation of a nuisance.

## **SECTION 1313.0. PROTECTION OF ADJOINING PROPERTY**

Adjoining property shall be completely protected from any damage incidental to the building operation when the owner of the adjoining property permits free access to the building at all reasonable times to provide the necessary safeguards in accordance with section 1308.

## **SECTION 1314.0. PROTECTION OF FLOOR AND WALL OPENINGS**

**1314.1. Noncombustible Floor Construction.**—The arches, slabs or structural floor fillings of buildings of fireproof construction (type 1) and noncombustible construction (type 2) shall be installed as the building progresses.

**1314.2. Combustible Floor Construction.**—In wood joist floor construction (types 3 and 4) when double flooring is used, the underfloor shall be laid on each story as the building progresses; and when double floors are not used, the floors shall be planked over two (2) stories below the level where work is being performed.

**1314.3. Steel Structural Frames.**—In steel construction, the entire tier of iron or steel beams upon which the structural work is in progress shall be planked over, with the exception of necessary hoistways and permanent openings; and in no case shall the steel work advance more than six (6) floors ahead of the permanent floor construction.

**1314.4. Guard-Rails.**—All floor and wall openings shall be protected with substantial guard-rails and toe boards in accordance with accepted practice.

## **SECTION 1315.0. SCAFFOLDS**

**1315.1. Load Capacity.**—All scaffolding shall be designed and constructed so as to support four (4) times the maximum weight placed thereon and shall be braced horizontally and diagonally to prevent lateral movement.

**1315.2. Erection.**—Built-up, swinging, and suspended scaffolds shall be erected under the direction of a licensed class C builder.

### **1315.3. Fire Retardant Construction.**

**1315.3.1. All Buildings.**—In the erection, alteration or maintenance of buildings of all occupancy groups, all scaffolding exceeding seventy (70) feet in height shall be constructed of noncombustible or fire retardant materials complying with the provisions of article 9 for scaffolding.

**1315.3.2. Institutional Buildings.**—All scaffolding used in construction operations involving the repair or partial demolition of institutional buildings (occupancy groups H-1 and H-2), during occupancy of the building shall be constructed of slow-burning materials complying with the provisions of article 9.

## **SECTION 1316.0. OMITTED**

## **SECTION 1317.0. STAIRWAYS AND LADDERS**

**1317.1. Temporary Stairways.**—When a building has been constructed to a greater height than fifty (50) feet or four (4) stories, or when an existing building which exceeds fifty (50) feet in height is altered, at least one temporary lighted stairway shall be provided unless one or more of the permanent stairways are erected as the construction progresses.

**1317.2. Ladders.**—Temporary ladders when permitted for access to floors before stairways are installed, or which are designed for other working purposes, shall extend at least forty-two (42) inches above the floor level which they serve.



**SECTION 1318.0. LIGHTING**

All stairways and parts of buildings under demolition, erection or repair shall be adequately lighted while persons are engaged at work to comply with the provisions of sections 627.

**SECTION 1319.0. FIRE HAZARDS**

The provisions of this Code and of the fire prevention regulations shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

**1319.1. Temporary Heating.**—Whenever salamanders or other heating devices are used for temporary heating, all regulations as to maximum temperature, distance from combustible materials, spark arrestors, removal of noxious gasses, and other requirements prescribed by the building official shall be fully observed. When the source of temporary heat consists of salamanders or other open-flame devices temporary canvas enclosures shall comply with section 904.6.

**1319.2. Steam Boilers.**—All temporary or permanent high pressure steam boilers shall be operated only by licensed operating engineers. When located within a building or within ten (10) feet thereof, all such boilers shall be enclosed with approved noncombustible construction.

**1319.3. Storage of Flammables.**—Storage of gasoline for hoists, oils, paints and other highly flammable materials shall be permitted only as specified in article 4 and when stored in approved safety containers. The storage of larger quantities may be approved by the administrative official when stored in separate compartments or enclosures of approved noncombustible construction.

**1319.4. Flame Cutting and Welding.**—The use of oxyacetylene torches for cutting or welding shall be permitted only in accordance with the applicable standards for air and gas welding in building construction.

**1319.5. Concrete Forms.**—No combustible materials shall be stored on any floor of a building under construction until all combustible concrete forms are removed from the tier immediately above.

**1319.6. Fire-Extinguishing Equipment.**—Required fire extinguishers, water buckets, auxiliary fire-fighting tools or other portable extinguishing equipment shall be installed and main-

tained on all floors of a construction operation in accessible locations as required in section 1218.2.

**1319.7. Standpipes and Fire Lines.**—Where standpipes are provided as a permanent part of the building, they shall be installed and made ready for instant use of the fire department as the structure progresses in accordance with the provisions of section 1207.5. Free access from the street to such standpipes shall be maintained at all times; and no materials shall be stored within five (5) feet of any fire hydrant or in the roadway between such hydrant and the center line of the street.

**1319.8. Housekeeping.**—Rubbish and trash shall not be allowed to accumulate on the site and shall be removed as fast as conditions warrant; combustible rubbish shall be removed daily, and shall not be disposed of by burning on the premises or in the immediate vicinity and the entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulations of trash, rubbish, nuts, bolts, small tools and other equipment.

## **SECTION 1320.0. DUST AND DEBRIS CONTROL**

Every construction or maintenance operation which results in the diffusion of dust, stone and other small particles, toxic gases or other harmful substances in hazardous quantities shall be safeguarded by means of local ventilation or other protective devices to insure the safety of the public as required by the regulations of the building official.

**1320.1. Removal of Dust.**—Dust, sand blasts or other harmful agents when employed or occurring in construction operations shall be disposed of at or near the point of origin to prevent their diffusion over adjoining premises or streets.

## **SECTION 1321.0. WELDING SAFETY PRECAUTIONS**

**1321.1. Welding Enclosures.**—All welding and flamecutting operations shall be performed in protected areas with full consideration to safety and fire hazards. Such closed spaces shall be properly ventilated while welding or cutting is being done. Suitable protection against the rays of the electric arc shall be maintained by the contractor where arc-welding operations might be viewed within harmful range by persons other than the welding operators and inspectors.

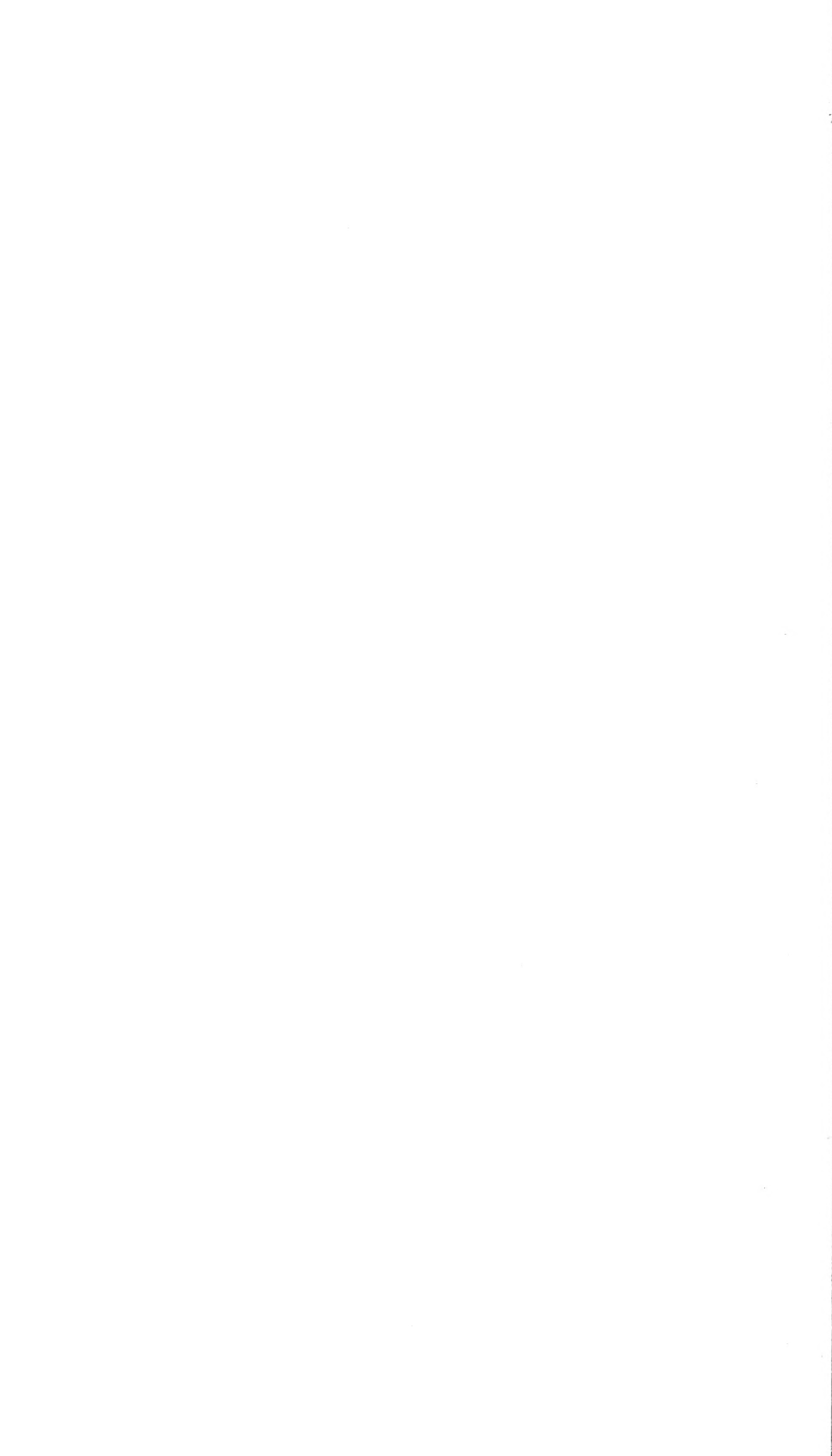
**1321.2. Flammable Materials.** — Proper precautions shall be taken to avoid all risk of fire or explosion and no flammable or explosive materials shall be stored in the vicinity of welding or cutting operations.

## **SECTION 1322.0. SANITATION**

Every building in the course of demolition, erection or repair shall be provided with toilet and drinking water facilities.

## **SECTION 1323.0. DISPUTES**

The building official, when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner, tenant and their agents who fail to conform to the requirements of this article directing him to take the necessary remedial action. If the person whose duty it is to protect his own or adjoining property under those provisions fails to proceed to fully comply with such notice within three (3) days of the receipt thereof, or within a reasonable time thereafter as determined by the building official, he may cause the necessary work to be done when the safety and general welfare of the public are involved. The cost of such work shall become a lien against the property of the offending owner and the legal authority of the municipality shall institute appropriate action for its recovery.



## SIGNS AND OUTDOOR DISPLAY STRUCTURES

<p>1400.0 Scope</p> <p>1401.0 Definitions</p> <p>1402.0 Plans, Specifications and Permits</p> <p>1403.0 Exemptions</p> <p>1404.0 Unsafe and Unlawful Signs</p> <p>1405.0 Maintenance and Inspection</p> <p>1406.0 Existing Signs</p> <p>1407.0 Registration and Identification</p> <p>1408.0 Bonds and Liability Insurance</p>	<p>1409.0 General Requirements for All Signs</p> <p>1410.0 Ground Signs</p> <p>1411.0 Roof Signs</p> <p>1412.0 Wall Signs</p> <p>1413.0 Projecting Signs</p> <p>1414.0 Marquee Signs</p> <p>1415.0 Miscellaneous and Temporary Signs</p> <p>1416.0 Illuminated Signs</p> <p>RS 14 Reference Standards</p>
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### TABLES

14-1	1409.6.1.	Plastic Facings for Ground Signs and Wall Signs (Noncombustible Material)
14-2	1409.6.2.	Plastic Facings for Roof Signs, Projecting Signs, and Marquee Signs (Noncombustible Material)
14-3	1409.7.1.	Plastic Facings for Ground Signs and Wall Signs (Combustible Materials)
14-4	1409.7.2.	Plastic Facings for Roof Signs (Combustible Materials)

### SECTION 1400.0. SCOPE

The provisions of this article shall govern the construction, alteration, repair and maintenance of all signs and outdoor display structures together with their appurtenant and auxiliary devices in respect to structural and fire safety.

**1400.0. Zoning Law.**— Where more restrictive in respect to location, use, size or height of signs and outdoor display structures, the limitations of the zoning laws shall take precedence over the restrictions of the Building Code.

**1400.2. Other Standards.**— Unless otherwise specifically provided herein, conformity to the applicable standards for signs and outdoor display structures listed in reference standard RS-14 shall be deemed to meet the requirements of this Code.

### SECTION 1401.0. DEFINITIONS

For definitions to be used in the interpretation of this article, see section 201.

## **SECTION 1402.0. PLANS, SPECIFICATIONS AND PERMITS**

**1402.1. Owners Consent.**—Before any permit is granted for the erection of a sign or outdoor display structure, plans and specifications shall be filed with the building official showing the dimensions, materials and required details of construction including loads, stresses and anchorage. The applications shall be accompanied by the written consent of the owner or lessee of the premises upon which the sign is to be erected.

**1402.2. New Signs.**—No new sign shall hereafter be erected, constructed, altered or maintained except as herein provided and until after a permit has been issued by the building official and the required bond shall have been filed in accordance with section 1408.

**1402.3. Alterations.**—No sign shall be enlarged or relocated except in conformity to the provisions of this article for new signs, nor until a proper permit has been secured. The changing of movable parts of an approved sign that is designed for such changes, or the repainting or reposting of display matter shall not be deemed an alteration provided the conditions of the original approval and the requirements of this article are not violated.

## **SECTION 1403.0. EXEMPTIONS**

No permit shall be required for the signs or outdoor display structures covered by the provisions of this section. Such exceptions however shall not be construed to relieve the owner of the sign from responsibility for its erection and maintenance in a safe manner.

**1403.1. Wall Signs.**—The wall signs herein listed shall not require a permit:

**1403.1.1. Painted Signs.**—Signs painted on the surface of masonry, concrete, frame or other approved building walls;

**1403.1.2. Store Signs.**—Non-illuminated signs erected over a show window or over the door of a store or business establishment which announce the name of the proprietor and the nature of the business conducted therein;

**1403.1.3. Other Wall Signs.**—Any wall sign erected on a building or structure, which is not more than one (1) square foot in area;

**1403.1.4. Fence Signs.**—Signs painted on the surface of enclosure or division fences, or on picket or other ornamental fences.

**1403.2. Ground Signs.**—The ground signs herein listed shall not require a permit:

**1403.2.1. Sale or Rent.**—Signs erected to announce the sale or rent of the property so designated, provided such signs are not over ten (10) feet in height nor more than sixty (60) square feet in area;

**1403.2.2. Transit Directions.**—The erection or maintenance of a sign designating the location of a transit line, a railroad station or other public carrier when not more than three (3) square feet in area;

**1403.2.3. Street Signs.**—Signs erected by the municipality for street direction.

**1403.3. Temporary Signs.**—The temporary signs herein listed shall not require a permit:

**1403.3.1. Construction Signs.**—Construction signs, engineers' and architects' signs and other similar signs which may be authorized by the building official in connection with construction operations;

**1403.3.2. Special Displays.**—Special decorative displays used for holidays, public demonstrations or promotion of civic welfare or charitable purposes, when authorized by the municipal authorities, on which there is no commercial advertising, provided the municipality is held harmless for any damage resulting therefrom as provided in section 1408.

## **SECTION 1404.0. UNSAFE AND UNLAWFUL SIGNS**

**1404.1. Notice of Unsafe Signs.**—When any sign becomes insecure, in danger of falling, or otherwise unsafe, or if any sign shall be unlawfully installed, erected or maintained in violation of any of the provisions of this Code, the owner thereof or the person or firm responsible for maintaining the structural security of the sign, shall upon written notice of the building official, forthwith in the case of immediate danger and in any case within not more than ten (10) days, make such sign conform to the provisions of this article or shall remove it. If within ten (10) days the order is not complied with, the building official may remove such sign at the expense of the owner or lessee thereof as provided in Part I, section 116.

## **1404.2. Unlawful Signs.**

**1404.2.1. Egress Obstructions.**—The building official shall notify the owner or lessee of the building or structure by registered mail whenever a sign is so erected as to obstruct free ingress to or egress from a required door, window, fire escape or other required exitway.

**1404.2.2. Projecting Signs.**—A projecting display sign erected at other than right angles to the wall of a building or structure outside of the building line which extends above the roof cornice or parapet wall, or above the roof level when there is no cornice or parapet wall and which obstructs access to the roof is hereby deemed unlawful. Such signs shall be reconstructed or removed as herein required.

**1404.2.3. Alley Signs.**—No signs shall be permitted to project into public alleys or private ways.

## **SECTION 1405.0. MAINTENANCE AND INSPECTION**

The building official may order the removal of any sign that is not maintained in accordance with the provisions of this article.

**1405.1. Maintenance.**—All signs for which a permit is required, together with all their supports, braces, guys, and anchors shall be kept in repair in accordance with the provisions of this article and Part I; and when not galvanized or constructed of approved corrosion-resistive noncombustible materials shall be painted when necessary to prevent corrosion.

**1405.2. Housekeeping.**—It shall be the duty and responsibility of the owner or lessee of every sign to maintain the immediate premises occupied by the sign in a clean, sanitary and healthful condition.

**1405.3. Inspection.**—Every sign for which a permit has been issued and every existing sign for which a permit is required including roof, ground, wall, marquee and pole signs, shall be inspected at least once in every calendar year by an engineer, architect or sign hanger approved by the building official for this work.

**1405.3.1. Report of Inspection.**—The owner, or lessee of the sign shall file a copy of the annual inspection report with the building official.



**SECTION 1406.0. EXISTING SIGNS**

**1406.1. Removing or Reconstructing Signs.**—No sign heretofore approved and erected shall be repaired, altered or moved, nor shall any sign, or any substantial part thereof, which is blown down, destroyed or removed, be re-erected, reconstructed, rebuilt or relocated unless it is made to comply with all applicable requirements of this article.

**1406.2. Repair of Unsafe Signs.**—This section shall not be construed to prevent the repair or restoration to a safe condition as directed by the building official of any part of an existing sign when damaged by storm or other accidental emergency.

**1406.3. Relocating Signs.**—Any sign that is moved to another location either on the same or to other premises shall be considered a new sign and a permit shall be secured for any work performed in connection therewith when required by this article and as provided under section 1416.0.

**SECTION 1407.0. REGISTRATION AND IDENTIFICATION**

**1407.1. Registration.**—Every ground sign and roof sign shall be registered with the building official by the person maintaining the same.

**1407.2. Identification.**—Every sign for which a permit has been issued and hereafter erected or constructed shall be plainly marked with the name of the person, firm or corporation owning and maintaining or operating such sign.

**SECTION 1408.0. BONDS AND LIABILITY INSURANCE**

**1408.1. Filing Bond.**—No person shall erect, install, remove or rehang any sign for which a permit is required under the provisions of this Code until an approved bond shall have been filed in the sum of five thousand dollars (\$5000) as herein required.

**1408.2. Provision of Bond.**—Such bond shall be conditioned on the construction and erection of the sign in accordance with the provisions of this Code and shall protect and save the City of Boston harmless from any and all claims or demands for damages by reason of any negligence of the sign hanger, con-

tractor or his agents; or by reason of defects in the construction or damages resulting from the collapse or failure of any sign or part thereof.

**1408.3. Blanket Bond.**—Subject to the approval of the building official, a sign hanger or contractor may file a blanket bond covering the requirements of sections 1408.1 and 1408.2 for all work performed in the City of Boston. The form and amount of such bond shall be determined by the building official.

## **SECTION 1409.0. GENERAL REQUIREMENTS FOR ALL SIGNS**

All signs shall be designed and constructed in conformity to the provisions for materials, loads and stresses of articles 7 and 8 and the requirements of this article.

### **1409.1. Design Loads.**

**1409.1.1. Wind.**—The effect of special local wind pressures shall be thoroughly considered in the design; but in no case shall the wind load be assumed less than required by section 713 through 718.

**1409.1.2. Earthquake.**—Signs adequately designed to withstand wind pressures shall generally be considered capable of withstanding earthquake shocks except as provided for combined loading in section 720.

**1409.2. Illumination.**—No sign shall be illuminated by other than electrical means, and electrical devices and wiring shall be installed in accordance with the requirements of the Massachusetts Electrical Code. In no case shall any open spark or flame be used for display purposes unless specifically approved by the building official for locations outside of the fire limits.

**1409.3. Obstructions to Exitways.**—No sign shall be erected, constructed or maintained so as to obstruct or be attached to any fire escape, required exitway, window or door opening used as a means of egress or to prevent free passage from one part of a roof to another part thereof or access thereto as required by the provisions of article 6 or for the municipal fire-fighting forces.

**1409.4. Obstruction to Ventilation.**—No sign shall be attached in any form, shape or manner which will interfere with any opening required for ventilation in article 5; except that such signs may be erected in front of and may cover transom windows when not in violation of the provisions of this Code.

**1409.5. Use of Combustibles.**

**1409.5.1. Ornamental Features.**—In all signs required to be constructed of noncombustible materials under the provisions of this code, wood or other materials of combustible characteristics similar to wood may be used for moldings, cappings, trim, nailing blocks, letters, latticing, and other purely ornamental features.

**1409.5.2. Approved Combustible Plastics.**—The use of plastic which meets the requirements set forth below shall be permitted subject to the limitations of sections 1409.6 and 1409.7:

- a. burns no faster than two and one-half (2½) inches per minute in sheets sixty one-thousandths (60/1000) of an inch in thickness when tested in accordance with reference standard RS 14-1; or
- b. is not consumed in less than two (2) minutes when tested in accordance with reference standard RS 14-2.

Thickness of plastic materials will be determined in accordance with the methods of reference standard RS 14-3.

**1409.6. Sign Facings on Noncombustible Signs.**—If all parts of the sign other than the letters and decorations are made from noncombustible materials, the display surface or sign facing may be made of approved combustible plastic, or may be occupied or covered by letters and decorations made from, or faced with, approved combustible plastics not exceeding a total area calculated from the values given in tables 14-1 and 14-2.

**1409.6.1. Table 14-1.****Plastic Facings for Ground Signs and Wall Signs (Non combustible Material)**

Area of Facing or Display Surface	Area Occupied or Covered by Approved Combustible Plastics.
150 sq. ft. or less	100 percent of display surface area
Over 150 sq. ft., but not over 2,000 sq. ft.	150 sq. ft. plus 50 percent of the difference between 150 sq. ft. and the area of the display surface.
Over 2,000 sq. ft.	Not over 1,050 sq. ft. without permission of the building official.

**1409.6.2. Table 14-2:**

**Plastic Facings for Roof Signs, Projecting Signs, and Marquee Signs (Noncombustible Material)**

Area of Facing or Display Surface	Area Occupied or Covered by Approved Combustible Plastics
150 sq. ft. or less	100 percent of display surface area
Over 150 sq. ft., but not over 2,000 sq. ft.	150 sq. ft. plus 25 percent of the difference between 150 sq. ft. and the area of the display surface.
Over 2,000 sq. ft.	Not more than 575 sq. ft. without permission of the building official.

**1409.7. Sign Facings on Combustible Signs.**—If combustible materials are permitted in the framework, moldings, cappings, trim, nailing blocks, latticing or other parts of the sign, the display surface of sign facing may be occupied or covered by letters and decorations made from or faced with approved combustible plastics not exceeding a total area calculated from the values given in tables 14-3 and 14-4.

**1409.7.1 Table 14-3:**

**Plastic Facings for Ground Signs and Wall Signs (Combustible Materials)**

Area of Facing or Display Surface	Area Occupied or Covered by Approved Combustible Plastics
300 sq. ft. or less	50 percent of display surface area
Over 300 sq. ft. but not over 2,000 sq. ft.	150 sq. ft. plus 25 percent of the difference between 150 sq. ft. and the total area of the display surface
Over 2,000 sq. ft.	Not over 575 sq. ft. without permission of the building official.

**1409.7.2. Table 14-4:**

**Plastic Facings for Roof Sign (Combustible Materials)**

Area of Facing or Display Surface	Area Occupied or Covered by Approved Combustible Plastics
1,000 sq. ft. or less	25 percent of display surface area
Over 1,000 sq. ft. but not over 2,000 sq. ft.	250 sq. ft. plus 10 percent of the difference between 1,000 sq. ft and the total area of the display surface.
Over 2,000 sq. ft.	Not more than 350 sq. ft. without special permission of the building official.

**SECTION 1410.0. GROUND SIGNS**

**1410.1. Obstructions to Traffic.**—No ground sign shall be erected so as to obstruct free access to or egress from any building.

**1410.2. Setback.**—No ground sign shall be set nearer to the street lot line than the established building line.

**1410.3. Bottom Clearance.**—The bottom capping of all ground signs shall be at least thirty (30) inches above the ground but the intervening space may be filled with open lattice work or platform decorative trim.

**1410.4. Fire Zone Limitations.**

**1410.4.1. Fire Zone No. 1.**—In Fire Zone No. 1, no ground sign shall be constructed of combustible materials, except as provided in section 1409.5.

**1410.4.2. Fire Zone No. 2.**—In Fire Zone No. 2, structural frames may be erected of wood or other materials of similar combustible characteristics provided the sign facings are covered with metal or other approved noncombustible material, when not more than thirty-five (35) feet in height and seventy-five (75) feet in length.

**1410.4.3. Outside Fire Limits.**—Outside the fire limits, the structural frame of ground signs shall not be erected of combustible materials to a height of more than thirty-five (35) feet above the ground.

**1410.5. Maximum Size.**—In all locations, when constructed entirely of noncombustible material, ground signs may be erected to a height of one hundred (100) feet above the ground; and to greater heights when approved by the building official and located so as not to create hazard or danger to the public.

**1410.6. Supports and Anchorage.**—Ground signs shall be constructed and anchored to resist loads acting in any direction on the sign, in accordance with the provisions of article 7. Anchors and supports shall be designed for safe bearing loads on the soil and for an effective resistance to pullout amounting to a force twenty-five (25) percent greater than the required resistance to overturning. Anchors and supports shall penetrate to a depth of at least four (4) feet. Whenever anchors or supports consist of wood embedded in the soil, the wood shall be treated under pressure with creosote or approved preservative before erection. This requirement shall not apply to signs which are not to remain in place for more than six (6) months. Members furnishing structural support for signs shall be designed

in accordance with the requirements of article 8 and shall be of adequate thickness to meet the corrosion conditions.

## **SECTION 1411.0. ROOF SIGNS**

**1411.1. Materials.**—All roof signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1409.5. Provisions shall be made for electric ground of all metallic parts; and where combustible materials are permitted in letters or other ornamental features, all wiring and tubing shall be kept free and insulated therefrom.

**1411.2. Bottom Clearance.**—There shall be a clear space of not less than seven (7) feet between the lowest part of the sign and the roof level and at least five (5) feet between the vertical supports thereof.

**1411.3. Closed Signs.**—A closed roof sign shall not be erected to a height greater than fifty (50) feet above fireproof and noncombustible buildings (types 1 and 2); not more than thirty-five (35) feet above the roof of non-fireproof (type 3) buildings.

**1411.4. Open Signs.**—An open roof sign shall not exceed a height of one hundred (100) feet above the roof of buildings of fireproof and noncombustible construction, (types 1 and 2); and not more than sixty (60) feet above the roof of buildings of non-fireproof (type 3) construction.

**1411.5. Combustible Supports.**—Within Fire Zones Nos. 1 and 2, no roof sign which exceeds forty (40) feet in height shall be supported on or braced to wooden beams or other combustible construction of a building or structure unless otherwise approved by the building official.

**1411.6. Construction.**—Roof signs shall be constructed and anchored to resist loads acting in any direction on the sign in accordance with the provisions of article 7.

**1411.7. Location.**—Roof signs parallel to the street front shall be erected at least six (6) feet back from the walls of the building on which they are erected. When erected at an angle, truss supports must be at least six (6) feet back from the face of the walls of the building and the bottom of the sign shall be at least four (4) feet above the top of the parapet. No part of the sign shall be closer than two (2) feet from the face of the wall or parapet. Parapet type signs, on top of roof or parapet, of open letter type shall not have a letter height exceeding eighteen (18) inches on an eight (8) inch shelf. When letters are of greater height, they must be erected with a clearance of two (2) feet between letters.

## SECTION 1412.0. WALL SIGNS

**1412.1. Materials.**—Wall signs which have an area exceeding forty (40) square feet shall be constructed of metal or other approved noncombustible materials except for nailing rails and as provided in section 1409.5.

**1412.2. Reflectors.**—Lighting reflectors may project eight (8) feet beyond the face of the wall provided such reflectors are at least twelve (12) feet above the grade level; but in no case shall such reflectors project beyond a vertical plane two (2) feet inside the curb line.

**1412.3. Extension.**—Wall signs shall not be erected to extend above the top of the wall, nor extend beyond the ends of the wall to which they are attached unless meeting all the requirements for roof signs, projecting signs or ground signs as the case may be.

**1412.4. Supports.**—Wall signs shall be constructed and supported to resist loads acting in any direction on the sign in accordance with the provisions of article 7. Attachment shall be by means of metal anchors, bolts, or similar devices. Wooden blocks or anchorage with wood used in connection with screws or nails shall not be used, except in the case of wall signs attached to buildings having walls of wood. No wall sign shall be entirely supported by an unbraced parapet wall.

## SECTION 1413.0. PROJECTING SIGNS

**1413.1. Materials.**—Projecting signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1409.5.

**1413.2. Maximum Projection.**—No such sign shall project over a street or other public space more than ten (10) feet from the face of the building or structure, nor in any case beyond a vertical plane two (2) feet inside the curb line.

**1413.3. Clearances.**—A clear space of not less than ten (10) feet shall be provided below all parts of such signs.

**1413.4. Supports.**—Projecting signs shall be constructed and supported to resist loads acting in any direction on the sign in accordance with the provisions of article 7. Attachment shall be by means of metal anchors, bolts, supports, chains, wire ropes, rods, or other similar devices. No staples or nails shall be used to secure any projecting sign to any building. Turnbuckles or

other equivalent means of adjustment shall be placed in all chains, wire ropes, or rods supporting or bracing projecting signs. All chains, wire ropes, or rods, and their attachments, shall be galvanized or of corrosion-resistant material, and no such supports shall be attached to an unbraced parapet wall.

## **SECTION 1414.0. MARQUEE SIGNS**

**1414.1. Materials.**—Marquee signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1409.5.

**1414.2. Height.**—Such signs shall not exceed seven (7) feet in height nor shall they project below the fascia of the marquee nor lower than ten (10) feet above the sidewalk.

**1414.3. Length.**—Marquee signs may extend the full length but in no case shall they project beyond the ends of the marquee.

**1414.4. Supports.**—Construction and anchorage of marquee signs shall conform to the requirements for projecting signs under section 1413.4.

## **SECTION 1415.0. MISCELLANEOUS AND TEMPORARY SIGNS**

**1415.1. Pole Signs.**—Pole signs shall be constructed entirely of noncombustible materials except as provided in section 1409.5; and shall conform to the requirements for ground or roof signs as the case may be. Such signs may extend beyond the street lot line if they comply with the provisions of section 1413 for projecting signs.

**1415.2. Banner and Cloth Signs.**—Temporary signs and banners attached to or suspended from a building, constructed of cloth or other combustible material shall be strongly constructed and shall be securely attached to their supports. They shall be removed as soon as torn or damaged and in no case later than sixty (60) days after erection; except that permits for temporary signs suspended from or attached to a canopy or marquee shall be limited to a period of ten (10) days.

**1415.3. Maximum Size.**—Temporary signs of combustible construction shall be not more than ten (10) feet in one dimension nor more than five hundred (500) square feet in area.

**1415.4. Rigid Frames.**—When more than one hundred (100) square feet in area, temporary signs and banners shall be made of rigid materials with rigid frames.



**1415.5. Projection.**—Temporary signs of cloth and similar combustible construction shall not extend more than twelve (12) inches over or into a street or other public space except that such signs when constructed without a frame may be supported flat against the face of a canopy or marquee or may be suspended from the lower fascia thereof but shall not extend closer to the sidewalk than eight (8) feet.

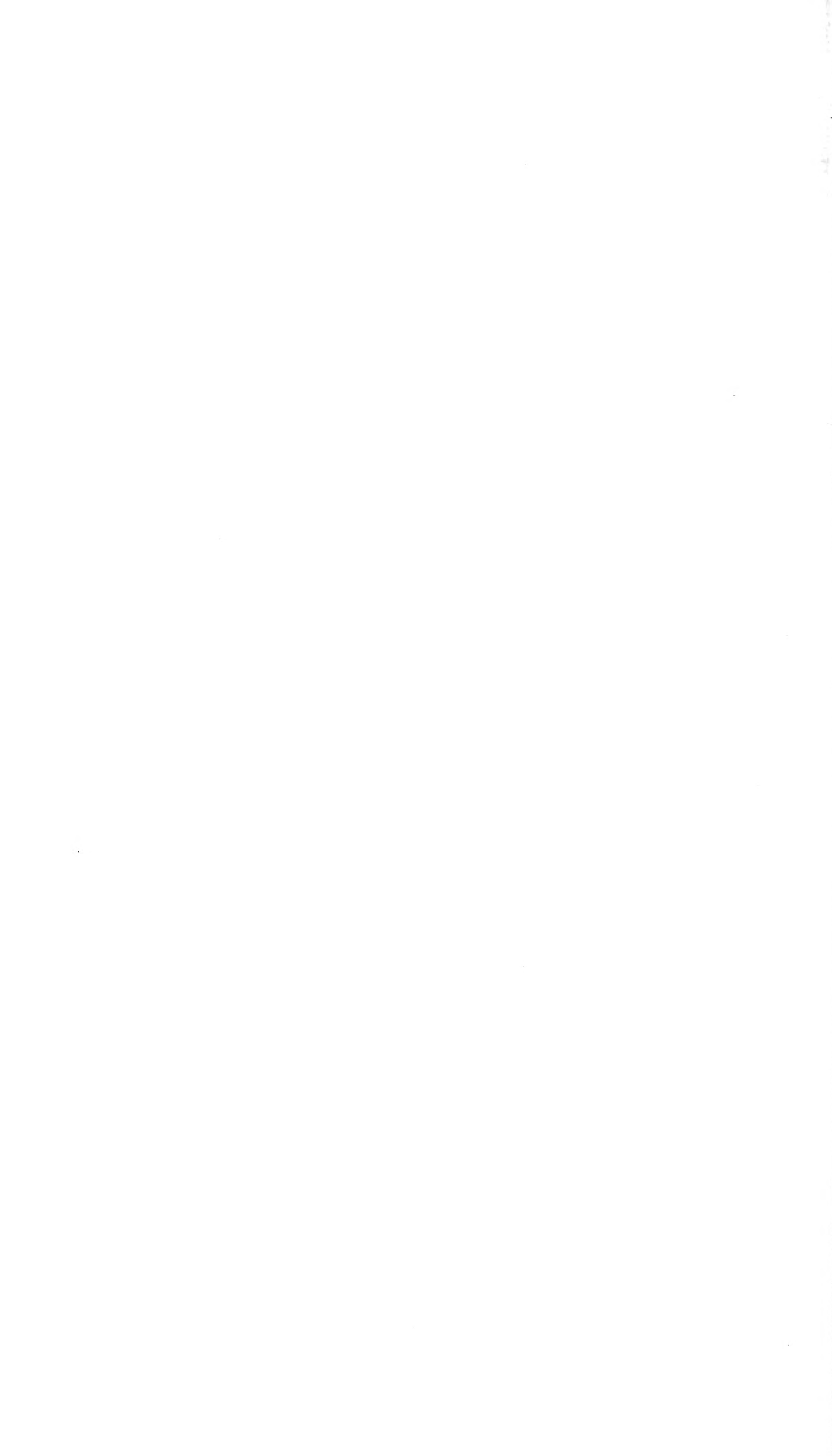
**1415.6. Special Permits.**—All temporary banners suspended from buildings or hung on poles, which extend across streets or other public spaces shall be subject to special approval of the municipal authority having jurisdiction.

## **SECTION 1416.0. ILLUMINATED SIGNS**

**1416.1. Permits.**—All electrically illuminated signs shall conform to the requirements of the Massachusetts Electrical Code. Permits shall be issued for the erection or maintenance of illuminated signs within the limitations set forth in this article for the location, size and type of sign or outdoor display.

**1416.2. Limitations.**—Illuminated signs of two hundred and fifty (250) square feet or more in area shall be extinguished at one o'clock (1:00) a.m.

**1416.3. Relettering Signs.**—The requirements of this section shall not apply to the relettering of illuminated signs, except where such relettering requires a change of wiring or piping of the sign.



# RS 14

## REFERENCE STANDARD RS 14 SIGNS AND OUTDOOR DISPLAY STRUCTURES

### List of Reference Standards

ANSI A60.1 1949  
Standard for Signs and Outdoor Display Structures

ASTM D374 1968  
Tests for Thickness of Solid Electrical Insulation

ASTM D568 1968  
Test for Flammability of Flexible Plastics

ASTM D635 1968  
Test for Flammability of Self-Supporting Plastics

RS 14-1 ASTM D635 1968  
Test for Flammability of Self-Supporting Plastics

RS 14-2 ASTM D568 1968  
Test for Flammability of Flexible Plastics

RS 14-3 ASTM D374 1968  
Tests for Thickness of Solid Electrical Insulation



## ELECTRICAL WIRING AND EQUIPMENT

## SECTION 1500.0. SCOPE

Under Ch. 617 of G.L., Acts of 1950, Ch. 143 of the G.L. is amended to provide that the State Board of Fire Prevention shall make and from time to time alter, amend and repeal rules and regulations relative to the installation, repair and maintenance of electrical wiring and electrical fixtures. Section 2 of this Act provides that all by-laws and ordinances of cities and towns relating to such installation, repair and maintenance shall be annulled. In compliance with this Act all such installation, repair and maintenance in the City of Boston shall be in conformance with the Massachusetts Electrical Code, Form FPR-11, effective November 17, 1966, as amended. Supervision of these regulations in the City of Boston shall be under the jurisdiction of the building official.

Massachusetts Electrical Contractors Association 864-1340  
386 Beale Street Cambridge  
2.75 for latest code (5 Oct 1970)

The Massachusetts Electrical Code may be obtained at the  
~~Public Document Room of the State House, Boston.~~



## ELEVATOR, DUMBWAITER AND CONVEYOR EQUIPMENT INSTALLATION AND MAINTENANCE

1600.0	Scope	1617.0	Industrial Lifts and Loading Ramps
1601.0	Definitions	1618.0	Automotive Lifts
1602.0	Plans, Specifications and Permits	1619.0	Conveyors
1603.0-		1620.0	Electric Wiring and Equipment
1610.0	Omitted	RS-16	Reference Standards
1611.0	Elevator Exitway Restrictions		
1612.0-			
1616.0	Omitted		

### SECTION 1600.0. SCOPE

Except as may be otherwise provided by statute, the provisions of this article shall control the design, construction, installation, maintenance and operation of all elevators, dumbwaiters, moving stairways, moving walks and special hoisting and conveying equipment hereafter operated, installed, relocated or altered in all buildings and structures. The design, construction, installation, maintenance and operation of all miscellaneous hoisting and elevating equipment and amusement devices shall be subject to such special requirements as are deemed necessary by the building official to secure their safe operation. The provisions of this article shall not apply to portable elevating devices used to handle materials only and located and operated entirely within one (1) story. All equipment shall be designed, constructed, installed, operated and maintained in compliance with General Laws Chapter 143, Sections 62 to 71G inclusive, and with Massachusetts Department of Public Safety Elevator and Escalator Regulations ELV-1, ELV-1 Revised and ELV-2, issued by the Board of Elevator Regulations.

**1600.1. Standard Code Adopted.**— Except as otherwise provided in this Code and except where more restrictive provisions govern, the construction, alteration, maintenance, operation, inspections and tests of industrial lifts and loading ramps, automotive lifts and conveyors shall conform to the provisions of reference standard RS-16.

## **SECTION 1601.0. DEFINITIONS**

Definitions contained in section 201 of this Code and the definitions of the applicable Massachusetts Department of Public Safety Elevator and Escalator Regulations ELV-1, ELV-1 Revised, and ELV-2 for elevator installations and equipment shall be used in the interpretation of this article.

## **SECTION 1602.0. PLANS, SPECIFICATIONS AND PERMITS**

The person, firm or corporation responsible for the installation, relocation, or alteration of any equipment covered by this article shall file an application for permit with the building official as required in Part I section 110 of this Code, accompanied by governing specifications and accurately scaled and fully dimensioned plans showing the location of the installation in relation to the plans and elevation of the building; the location of the machinery room and equipment to be installed, relocated or altered; and all structural supporting members thereof, including foundations; and shall specify all materials to be employed and all loads to be supported or conveyed. Such plans and specifications shall be sufficiently complete to illustrate all details of construction and design of the proposed installation.

## **SECTIONS 1603.0. TO 1610.0. OMITTED**

## **SECTIONS 1611.0. ELEVATOR EXITWAY RESTRICTIONS**

Elevators shall not be accepted as a required means of egress. Elevators shall not be installed in a common enclosure with a stairway, and the path of travel on any exit stairway shall not pass directly in front of any elevator hoistway door.

## **SECTIONS 1612.0. TO 1616.0. OMITTED**

## **SECTION 1617.0. INDUSTRIAL LIFTS AND LOADING RAMPS**

Except as exempted by section 1600 or as may be otherwise provided by statute, the provisions of this section and section



1618.0. shall control the design, construction, installation, maintenance and operation of all automotive lifts, industrial lifts and loading dock ramps hereafter installed, relocated or altered in all buildings and structures. All such equipment shall be constructed, operated and maintained in compliance with accepted engineering practice. The purpose of this Code is to provide reasonable safety for life and limb. In case of practical difficulty or unnecessary hardship the building official may grant exceptions from the literal requirements or permit the use of other methods but only when it is clearly evident that reasonable safety is thereby secured.

**1617.1. General Requirements.**

**1617.1.1. Markings and Labels.** — All material lifts and loading ramps shall be marked with the name of manufacturer, model number, serial number, and rated capacity; and such markings shall be legibly stamped or etched on a metal plate which shall be permanently secured in a convenient place for inspection. Such nameplates shall not be obscured, obliterated or changed.

**1617.1.2. Controls.** — The controls shall be so located that the operator has a full and unobstructed view of the lift area at all times. All control devices shall be accessible to the operator without exposing him to danger. No alterations or changes shall be made in the control device, or its manner of use which will render its normal functioning inoperative.

**1617.1.3. Lift Control.** — When the device used for controlling the travel of the lift in either direction is not continuous pressure or deadman type, an emergency stop button shall be provided and so located as to be readily accessible to the operator at all times.

**1617.1.4. Electrical Wiring.** — All electrical wiring shall comply with the Massachusetts Electrical Code for ordinary locations.

**1617.2. Maintenance.**

**1617.2.1. Owner Responsibility.** — The owner or his agent shall be responsible for the care, maintenance, and safe operation of all equipment covered by this article after the installation thereof and its acceptance by him or its approval by the building official. The owner, or his agent shall not permit the equipment to be used unless it is, to the best of his knowledge, in safe operating condition.

**1617.2.2. Housekeeping.** — The spaces around, or beneath the equipment shall be kept clean; no rubbish or oil shall be allowed to accumulate therein, nor shall any part of this space be used for storage of materials or equipment.

All parts, except such parts as require freedom of movement, shall be kept tight at all times.

All mechanical working parts shall be kept free of rust, and properly lubricated and adjusted.

The owner, or his agent, shall be responsible for inspecting the oil level in all hydraulic systems to insure that it is at, or above the manufacturer's prescribed minimum level.

**1617.2.3. Lighting.**—The entire operating area shall be illuminated to provide a distributed intensity of not less than three (3) foot-candles over the area of operating floor and platform.

**1617.3. Pressure Tanks.**—All separate tanks for liquid storage under pressure, not an integral part of the cylinder assembly, shall conform to the provisions for unfired pressure vessels listed in reference standard RS16-2 and shall be marked with a securely attached metal label to indicate the approved operating pressure. For hydro-pneumatic systems the storage capacity shall be such that with the lift in fully elevated position there shall remain not less than three (3) inches of usable oil in the storage tank. Adequate means shall be provided to determine that the oil level in reservoir, with lift in the lowest position, is at or above the safe minimum operating level as prescribed by the manufacturer.

**1617.4. Design and Construction.**—The construction and installation of all power industrial lifts and loading ramps shall comply with the provisions of this section and the accepted standards listed in reference standard RS16-1.

**1617.4.1. Rated Load.**—The lifting capacity of the lift shall be not less than fifty (50) pounds per square foot of gross platform area.

**1617.4.2. Platform Construction.**—The platform and its supports shall be designed for the loads to be transmitted within the strength and deflection limitations herein specified, when one-half (1/2) the capacity load is applied as a static center concentration within twelve (12) inches of the loading edge, the lift platform shall not deflect more than one-half (1/2) inch at any edge point.

**1617.5. Platform and Hoist Protection.**

**1617.5.1. Unprotected Space Not More Than Five Feet.**—When the lift rise is such that the unprotected vertical distance from the landing to the bottom edge of the vertical side of the platform is not more than five (5) feet, protection shall be provided as follows:

- a. **toe guards.** A toe guard plate not less than eight (8) inches in width shall be provided on all unprotected sides. It shall be made of steel, not less than No. 11 gage in thickness, attached flush with the vertical edge of the platform and slanted inwardly at an angle of approximately thirty (30) degrees from the vertical. Skirts may be used in lieu of toe guards.
- b. **skirts.** For automatic operation, the unprotected sides of the platform shall be provided with metal or wood sheathing or skirts attached to the platform to protect the exposed vertical opening.
- c. **enclosures.** When toe guard or skirt protection is not provided the unprotected sides may be provided with solid or mesh enclosures to the full height of the lift rise. Mesh enclosure shall, by test, reject a two (2) inch ball.

**1617.5.2. Unprotected Space More Than Five Feet.**—When the unprotected space exceeds that set forth in section 1617.5.1, protection shall be provided as follows:

Sides used for loading or unloading at the lower level shall be protected with skirts as described in paragraph 1617.5.1, or by a landing gate with electrical contact, or an automatic landing gate.

Sides not used for loading or unloading shall be protected with skirts or enclosures as described in paragraph 1617.5.1.

**1617.5.3. Lift Rise More Than 5-1/2 Feet.**—When the lift rise exceeds five and one-half (5-1/2) feet above the lowest level, additional protection shall be provided as follows:

The upper landing shall be provided with a landing gate equipped with mechanical lock and electrical contact.

The sides of the platform not used for loading or unloading shall be provided with railings, mesh, or solid enclosures not less than three and one-half (3-1/2) feet high.

**1617.5.4. Surface Installations.**—When the lift is surface mounted, toe clearance space shall be provided on all unprotected sides. Such toe clearance shall provide not less than three (3) inches vertical and four (4) inches horizontal clearance when the platform is at its lowest position.

**1617.6. Platform Protection—Loading Ramps.**—The sides or edges of the loading ramps which rise above the surrounding platform shall be provided with skirt or toes guards protecting the opening under the sides of the ramp.

## **1617.7. Overload Protection.**

**1617.7.1. Electric-Hydraulic Operation.**—Hydraulic overload protection shall be provided by means of a relief valve that will prevent raising of the elevating device when it is loaded to one hundred and twenty-five (125) percent of rated capacity. The relief valve shall be so located that its operation will not cause the platform to lower.

**1617.7.2. Electric Operation.**—Electric overload protection shall be provided by means of a thermal cutout or other suitable device.

## **SECTION 1618.0. AUTOMOTIVE LIFTS**

All electric, hydraulic and hydro-pneumatic automotive lifts shall comply with the requirements of section 1617.0, 1617.1 and the applicable provisions of ELV-1, ELV-1 Revised and ELV-2 and Reference Standard RS 16-3.

**1618.1. Types.**—Lifts shall be classified as semi-hydraulic, full hydraulic or mechanical lifts according to their operation as described in the following subsections.

**1618.1.1. Semi-Hydraulic (Hydro-Pneumatic).**—A semi-hydraulic lift is an automotive lift of the plunger type which employs compressed air as the primary lifting and load sustaining agent; such compressed air acts continuously against a column of liquid to provide the lifting and load sustaining effort.

**1618.1.2. Full Hydraulic.**—A full hydraulic lift is an automotive lift of the plunger type that employs a liquid under pressure as the direct lifting and load sustaining agent. Such a lift is so designed and constructed that the full weight of the load and lifting assembly rest on a continuous column of liquid which extends from the cylinder to the liquid control valve.

**1618.1.3. Mechanical Lifts.**—A mechanical lift is an automotive lift so designed that the motive power is transmitted to the lifting frame by mechanical means. There are three principal types: cable and drum; rack and pinion; and screw type.

**1618.2. Chassis and Axle Supports.**—Only those chassis and axle supports complying with the requirements of reference standard RS 16-3 may be used.

**1618.3. Safeties.**—All mechanical automotive lifts shall be equipped with approved safeties as herein specified.

**1618.3.1. Limit Stop.**—Every mechanical automotive lift shall be equipped with an automatic overtravel device to stop the

motor or drive machine before the lifting frame reaches safe limits of travel.

**1618.3.2. Holding Brake.**—When the friction of the gear train of the driving mechanism is insufficient to hold the load, the mechanical automotive lift shall be equipped with a brake or other locking device to automatically hold the lift at any level immediately on failure of the lifting power for any cause.

**1618.3.3. Stopping Brake.**—When the structural members of the lifting frame are so designed that they interfere with open doors or other projections from the vehicle, the automotive lift shall be provided with a quick acting automatic brake to stop the ascent of the lift in case of emergency.

**1618.4. Controls.**

**1618.4.1. Automatic Release.**—The direct control device shall be of a type that will automatically return itself to the neutral or off position upon release by the operator.

**1618.4.2. Speed Control.**—A speed control device shall be provided to control the descent of the lift at a speed of not more than twenty (20) feet per minute under rated load.

## SECTION 1619.0. CONVEYORS

**1619.1. Enclosures.**—All package elevators, boosters or lifts connecting successive floors or levels shall be enclosed in fire-resistive construction in conformity to the requirements of article 9.

**1619.2. Opening Protectives.**

**1619.2.1. Plans and Specifications.**—Whenever conveyor or other material-handling devices are designed to pass through floor, ceilings, partitions or walls, the plans and specifications shall give the necessary details of the opening protectives in respect to location, structural strength and fire-resistance.

**1619.2.2. Fire Curtains.**—Openings in partitions and walls through which conveyors pass shall have automatic fire dampers or curtains to prevent the spread of fire when, in the opinion of the building official, such protection is necessary due to the hazard of operation of the conveyors.

**1619.2.3. Fire Doors.**—All opening protectives shall meet the fire-resistive requirements of article 9 for the location, type of construction and use of the building or structure.

**1619.3. Machinery Guards.**—Adequate protection shall be provided around all moving parts of every conveying device in accordance with the approved rules.

**1619.4. Chute Enclosures.**—All slides and chutes shall be enclosed with fire-resistive construction or protected with approved automatic shutters of noncombustible construction to insure a full firestop between floors of the building or structure.

**1619.5. Conveyor Safeties.**—All power-operated conveyors, belts and other material moving devices, shall be equipped with automatic limit switches which will shut off the power in emergency and automatically stop all operation of the conveyors.

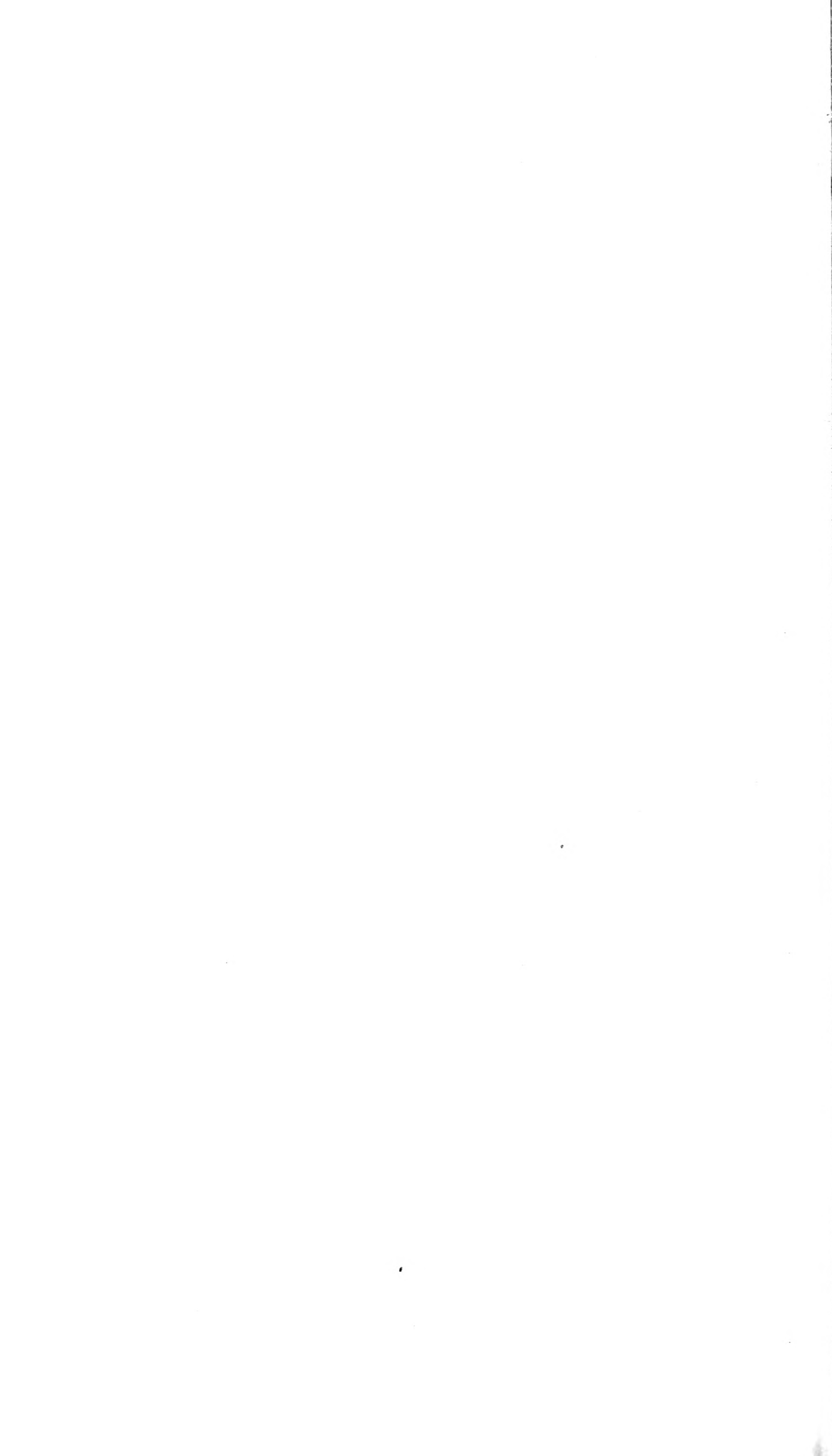
## **SECTION 1620.0. ELECTRIC WIRING AND EQUIPMENT**

All electric wiring and electrical equipment covered by this article shall comply with the requirements of the Massachusetts Electrical Code.

## ELEVATOR, DUMBWAITER AND CONVEYOR EQUIPMENT INSTALLATION AND MAINTENANCE

### List of Reference Standards

- RS 16**      ANSI    B20.1    1957  
Safety Code for Conveyors, Cableways and Related  
Equipment
- ASME                      1968  
Boiler and Pressure Vessel Code, Section VIII, Rules  
for Construction of Pressure Vessels, Division 1.  
Addenda — Winter 1969.
- USDC    CS 142    1965  
Commercial Standard for Automotive Lifts
- USDC    CS 202    1956  
Commercial Standard for Industrial Lifts and Hinged  
Loading Ramps
- RS 16-1**    USDC    CS 202    1956  
Commercial Standard for Industrial Lifts and Hinged  
Loading Ramps
- RS 16-2**    ASME                      1968  
Boiler and Pressure Vessel Code, Section VIII, Rules  
for Construction of Pressure Vessels, Division 1.  
Addenda — Winter 1969.
- RS 16-3**    USDC    CS 142    1965  
Commercial Standard for Automotive Lifts
- RS 16-4**    ANSI    B20.1    1957  
Safety Code for Conveyors, Cableways and Related  
Equipment





**PLUMBING, DRAINAGE AND GAS PIPING**

**SECTION 1700.0. STANDARD CODE ADOPTED**

**1701.0. Plumbing and Drainage.**—All plumbing and drainage shall be constructed, installed, and maintained in conformance with the Commonwealth of Massachusetts Uniform State Plumbing Code established under Chapter 358, Acts of 1965.

**1702.0. Gas Piping.**—All gas piping shall be constructed, installed, and maintained in conformance with the Commonwealth of Massachusetts Code for Installation of Gas Appliances and Gas Piping established under Chapter 737, Acts of 1960.

The Massachusetts Plumbing and Gas Piping Codes may be obtained at the respective Boards of Examiners, State Office Building, 100 Cambridge Street, Boston.



## AIR CONDITIONING, REFRIGERATION AND MECHANICAL VENTILATION

<p>1800.0 Scope</p> <p>1801.0 Definitions</p> <p>1802.0 Plans, Specifications and Permits</p> <p>1803.0 Tests</p> <p>1804.0 Inspections and Certificates</p> <p>1805.0 Operation and Maintenance</p> <p>1806.0 Existing Buildings and Installations</p> <p>1807.0 Omitted</p> <p>1808.0 General Requirements</p> <p>1809.0 Use of Refrigerants</p> <p>1810.0 Heating and Cooling Equipment</p>	<p>1811.0 Plumbing and Water Connections</p> <p>1812.0 Automatic Fire Doors and Dampers</p> <p>1813.0 Inlet and Outlet Openings</p> <p>1814.0 Ducts, Linings, and Coverings</p> <p>1815.0 Restaurant Cooking Equipment</p> <p>1816.0 Roof-Mounted Appliances</p> <p>RS 18 Reference Standards</p>
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### SECTION 1800.0. SCOPE

The provisions of this article shall control the design and installation of air-conditioning, refrigeration, ventilating, cooling and air exhaust systems hereafter installed, and all alterations or additions to existing systems; except refrigerating systems subject to inspection and regulation under federal or state law, or where specific exemption is made in this article, or where a special kind of ventilating or exhaust installation is required in a structure or occupancy use group in article 4, or in sections 521 or 522 for emergency ventilation.

**1800.1. Accepted Engineering Practice.**—All such systems and equipment constructed, installed and maintained in accordance with the applicable standards listed in Reference Standard RS-18 shall be deemed to conform to the provisions of this Code.

**1800.1.1. Standard Code Adopted.**—All installations of gas appliances must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under G.L., Chap. 737, Regulations made in accordance with the provisions of G.L., Ch. 148, Section 10, as amended, governing the construction, installation and operation of Oil Burning Equipment. In case of possible conflict, the greater requirement shall control.

**1800.1.2. Boiler Rules and Regulations.**—Attention is directed to the rules and regulations issued by the Board of Boiler Rules under the authority of Chapter 146 of the General Laws of the

Commonwealth of Massachusetts governing the construction, installation, testing, and inspection of boilers, air tanks, ammonia compressor safety valves, and refrigeration and air conditioning systems of five tons or more capacity. In case of possible conflict, the greater requirement shall control.

**1800.2. Cooperating Agencies.**—Nothing herein contained shall be deemed to nullify the federal, state or municipal rules and regulations governing the storage and use of flammable and explosive gases and chemicals, or the requirements of the Interstate Commerce Commission or other federal or state statutes governing the transportation and use of hazardous gases, explosives and other flammable substances.

## **SECTION 1801.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see Article 2.

## **SECTION 1802.0. PLANS, SPECIFICATIONS AND PERMITS**

**1802.1. Plans and Specifications.**—Where a permit is required an application shall be filed with the building official and if, due to the size of the equipment, the building official deems it necessary, such application shall be accompanied by specifications and diagrammatic mechanical drawings in sufficient detail, complying with the provisions of Part I, section 110, before a permit shall be issued for an air-conditioning, refrigerating or ventilating system. The plans shall be drawn to a scale of not less than one-eighth ( $1/8$ ) inch to the foot and shall show the location and arrangement of all equipment and distribution elements, including safeties and pressure controlling devices.

**1802.2. Permits.**—A permit shall be required for all new installations and for all major replacements in existing installations which may result in violation of this Code; or where required for the remedying of existing defective installations; except that permits will not be required for the following systems:

**1802.2.1. Residential Buildings.**—One- and two-family and multi-family dwellings (occupancy groups L-2 and L-3) shall not be required to have permits unless the refrigerating systems contain more than ten (10) pounds of refrigerants or are actuated by motors or engines of one and one-half ( $1-1/2$ ) horsepower or larger.

**1802.2.2. Unit Refrigerating Systems.**—In business, commercial, industrial and residential occupancy groups, B, C, D, E, H, and L, no permit shall be required for the installation of new self-contained unit refrigerating systems which contain not more than six (6) pounds of group 1 refrigerants as listed in reference standard RS 18-1.

**1802.3. Approved Refrigerants.**—It shall be unlawful to maintain or operate any refrigerating system without a permit when such is required by the provisions of section 1802.2, and no refrigerant other than that specified in the permit shall be employed in the system without the written approval of the building official.

## **SECTION 1803.0. TESTS**

No air-conditioning, refrigerating or ventilating system requiring a permit shall be operated until it has been tested and found safe by the building official. All tests shall be conducted in accordance with the standard safety code and the approved rules adopted thereunder.

## **SECTION 1804.0. INSPECTIONS AND CERTIFICATES**

All systems requiring permits shall be inspected by the building official upon their completion. If the system is found safe and in conformity to the requirements of this Code and the approved application, a certificate shall be issued by the building official upon request.

**1804.1. Concealment.**—It shall be unlawful for owners, contractors or workmen to lath over, or in any way to conceal any piping, outlet boxes or other parts of systems requiring a permit until an inspection has been made thereof and due notice given that the work has been approved.

**1804.2. Periodic Inspection.**—Refrigerating systems in buildings for assembly uses (occupancy group F) shall be inspected periodically. All refrigerating systems shall be subjected to such inspections and tests deemed necessary by the building official for the adequate protection of the public safety.

**1804.3. Defects and Repairs.**—Any defects or deficiencies revealed during inspection or reinspection of a refrigerating, air-conditioning or ventilating system which require repair to insure safe operation shall be rectified before the system is placed in use.

**1804.4. Owner's Statement.**—A statement shall be filed with the building official by the owner or lessee of the building that the required ventilating system will be kept in continuous operation at all times during the occupancy of the building and, if any smoke or fire detection devices or fire extinguishing systems have been installed, that he will have such devices and the fan shut-offs actuated by them tested and inspected by a competent person or agency at one year intervals or less. The owner or lessee shall also state that he will promptly make any necessary adjustments and repairs to keep the ventilating system and its safety devices in proper operation condition. A record of each inspection and test shall be maintained by the owner or lessee, and records for at least the last two years shall be made available for inspection by the building official.

**1804.5. Voluntary Systems.**—An owner's statement similar to that required in section 1804.4 shall be filed for all voluntary ventilating systems or other air duct systems when smoke detectors or fire protection devices are required.

## **SECTION 1805.0. OPERATION AND MAINTENANCE**

**1805.1. Housekeeping.**—All air-conditioning and refrigerating systems shall be maintained in a clean and orderly manner, free from accumulations of dust, oily waste or other debris; and all piping and machinery shall be kept readily accessible at all times for inspection and repair. Plenum chambers, air ducts, cooling and heating coils shall be kept clean, and unit filters shall be cleaned or renewed to insure adequate air flow in accordance with the approved rules.

## **SECTION 1806.0. EXISTING BUILDINGS AND INSTALLATIONS**

**1806.1. Existing Approvals.**—Existing refrigerating, air-conditioning and ventilating equipment heretofore legally installed may be continued in use, provided the public safety is not endangered thereby, and the system is maintained in a safe operating condition as required by the building official and in accordance with the standard safety code.

**1806.2. Unsafe Installations.**—If in the opinion of the building or fire officials, the continued use of existing equipment is unsafe, the building official shall order such use to cease until all defects are remedied.

**SECTION 1807.0. OMITTED****SECTION 1808.0. GENERAL REQUIREMENTS**

**1808.1. Ventilation and Noise Control.**—The minimum quantities of air and other requirements for the ventilation of habitable and occupiable rooms shall be as required by article 5, and for the ventilation of special uses and occupancies by article 4. Noise control requirements for mechanical equipment shall be as required by article 5.

**1808.2. Safety.**—All systems, equipment, and materials including any devices, apparatus, piping work, sheet metal work, insulation work, and supports therefor, used as part of or in connection with installations governed by this article, shall be designed, installed, located, and operated so that they will not create an immediate or potential danger to life or impair public health or welfare.

**1808.3. Openings.**—No openings for outdoor exhaust air discharges, air intakes, or reliefs from equipment shall be located and constructed so as to:

- a. Interfere with the proper functioning of other openings in the same building or in adjoining buildings.
- b. Interfere unreasonably with the occupants of the same building or adjoining buildings or with the general public.
- c. Create a fire or health hazard.

**1808.4. Construction.**—The construction, installation, and alteration of systems for providing mechanical ventilation, air conditioning, air cooling, air heating, and refrigeration, shall be in accordance with the following:

- a. Air conditioning and ventilating systems for all occupancies shall be constructed in accordance with the provisions of reference standard RS 18-2.
- b. Warm air heating and air conditioning systems for one- and two-family dwellings, for one story buildings 4,000 square feet or less in gross floor area provided ducts do not penetrate fire divisions, and for buildings classified in mercantile occupancy group C, 2,500 square feet or less in gross floor area shall be constructed and installed in accordance with the provisions of reference standard RS 18-3.
- c. Exhaust systems for cooking spaces requiring mechanical ventilation in accordance with the provisions of article 5

except kitchens located within dwelling units, shall be installed as provided in reference standard RS 18-4.

- d. Restaurant-type cooking equipment shall be provided with a means of ventilating such equipment constructed in accordance with the provisions of section 1815 and reference standard RS 18-5.

## **SECTION 1809.0. USE OF REFRIGERANTS**

Only approved refrigerants shall be used in any installation as determined by the life hazard of the use and occupancy of the building or structure, and as provided in the standard safety code.

**1809.1. Classification of Buildings.**—For the purpose of this article buildings shall be classified in respect to occupancy as follows:

**1809.1.1. Industrial Buildings** shall include occupancy groups A, B-1, B-2, D-1 and D-2;

**1809.1.2. Commercial Buildings** shall include occupancy groups C and E;

**1809.1.3. Public Assembly Buildings** shall include occupancy groups F-1, F-2, F-3 and F-4;

**1809.1.4. Institutional Buildings** shall include occupancy groups H-1 and H-2;

**1809.1.5. Residential Buildings** shall include occupancy groups L-1, L-2, and L-3;

**1809.1.6. Mixed Use Buildings**—In buildings of mixed use and occupancy as provided in section 213, the requirements of the standard safety code which secure the greatest public safety shall apply to the entire building; except that the requirements of the standards shall apply to each part separately when such uses are completely separated by horizontal and vertical fire divisions complying with the highest fire grading of table 9-1 for the separated uses. When high hazard uses are incidental to the main use of the building or part thereof, the area devoted to such high hazard use shall be enclosed with fire-resistive construction complying with this Code.

**1809.2. Storage of Refrigerants.**—Not more than three hundred (300) pounds of refrigerant shall be stored in approved containers in the machinery room. Quantities in excess of three hundred (300) pounds shall be stored in a separate accessory building or in a room used for no other purpose enclosed with not less than three (3) hour fire-resistive construction.



**1809.3. Smoke Detector.**—When in the opinion of the building or fire officials, the life safety of any use or occupancy is exceptionally hazardous, or when required for automatic operation of exhaust systems, all mechanical ventilating and air-conditioning systems shall be provided with an approved smoke detector.

## **SECTION 1810.0. HEATING AND COOLING EQUIPMENT**

**1810.1. Steam and Hot Water Heating Equipment.**—The installation of all steam and hot water apparatus in air-conditioning systems shall comply with the requirements of articles 10 and 11 for piping, flues and flue connections. Direct heating units when used in air-conditioning systems shall not exceed fifteen (15) pounds per square inch gage working pressure.

## **SECTION 1811.0. PLUMBING AND WATER CONNECTIONS**

**1811.1. Discharge Lines.**—Discharge lines from condensers and other equipment shall not be directly connected to the waste or sewer system but shall discharge over and above the rim of a trapped and vented plumbing fixture or other interceptor or into a separate storm water sewer as provided in article 17.

**1811.2. Water Connections.**—Water lines shall be connected to condensers to prevent siphoning into potable water supplies, and no water used for removing heat from a refrigerating system shall be discharged into any water supply directly or indirectly intended for human consumption.

## **SECTION 1812.0. AUTOMATIC FIRE DOORS AND DAMPERS**

**1812.1. Fire Walls and Fire Divisions.**—An approved fire door or an approved automatic fire shutter complying with the provisions of article 9 shall be provided at each side of a fire wall or fire division which is pierced by a duct of an air-conditioning or ventilating system. Such opening protectives shall be installed so as to be readily accessible for inspection and repair. When fire doors are not practical and where required in ducts, approved fire dampers shall be constructed of noncombustible materials and installed in the locations prescribed by reference standard RS 18-2.

**1812.2. Flammable Residues.**—Ducts for exhaust ventilating and air-conditioning systems which discharge or contain flammable vapors, dust or other solid residues shall extend to the exterior of the structure in the most direct manner possible and shall not pierce floors except when enclosed with construction of the required fire-resistance as required by section 911.0; nor shall such ducts transporting flammable matters extend through fire walls, nor shall they be incorporated in the structural elements of the building.

## **SECTION 1813.0. INLET AND OUTLET OPENINGS**

**1813.1. Exterior Intake Openings.**—Exterior fresh air intake openings when located on a street or alley lot line shall be installed not less than twelve (12) feet above grade; and all intakes shall be protected by approved corrosion-resistive screens. Fresh air intakes with less than thirty (30) feet exposure distance to openings in adjoining walls or buildings shall be protected with approved automatic fire shutters, curtains or other approved opening protectives complying with article 9.

**1813.2. Exterior Exhaust Openings.**—The exhaust openings shall be located on the exterior of structures with approved protecting guards, covers or other approved means of preventing the creation of a nuisance; and shall not circulate air downward in such manner as to strike pedestrians. The discharge outlet shall be located not less than twelve (12) feet above grade and not less than twenty (20) feet horizontally from a fire escape, exterior stairway or other required exitway.

**1813.3. Ventilation Duct Outlets.**—Ventilation ducts shall discharge to the outside atmosphere.

## **SECTION 1814.0. DUCTS, LININGS AND COVERINGS**

**1814.1. Materials and Supports.**—All ducts shall be constructed of approved, noncombustible, corrosion-resistive materials in accordance with the requirements of this article and the provisions of sections 1019 and 1119. Ducts may be of independent construction or may be incorporated in the walls or other parts of the structure, provided that the portion of the structure forming the duct enclosure meets the minimum requirements for strength and fireresistance specified herein or in article 9. They

shall be made reasonably air-tight throughout, without openings other than those required for the proper operation and maintenance of the air-conditioning or ventilating system. Ducts and all parts of the duct system shall be substantially supported and securely fastened to the structural members of the building with supports of approved, durable noncombustible materials. Duct sizes shall be based on the discharge capacity and size of the refrigerating system as specified in the standards.

**1814.2. Linings and Coverings.**—Only approved noncombustible materials shall be used for duct lining; nor shall combustible coverings be used on the outside of ducts carrying air of temperatures greater than one hundred and seventy-five (175) degrees F. Insulating materials forming a component or auxiliary part of any duct system shall be approved and meet the test requirements of article 9.

**1814.3. Location of Ducts.**—All ducts shall be installed so that they will not vitiate the strength of any structural member nor be subject to mechanical damage or rupture; nor shall the effectiveness of the fire protection of structural members be impaired. The firestopping of floors, partitions and walls shall not be destroyed where ducts pass through floors, ceilings, walls or partitions.

**1814.4. Clearances.**—Warm Air heating ducts shall be installed not nearer to any combustible construction than specified in reference standard RS 18-3 unless protected by at least one-quarter (1/4) inch of asbestos or other approved noncombustible insulating material.

**1814.5. Plenum Chambers.**—Plenum Chambers shall conform to all the minimum requirements specified in reference standard RS 18-3 for the type of heating system installed.

**1814.6. Corridors as Return Ducts.**—In all corridors, hallways or exitways which are used as the return exhaust of air-conditioning systems, an approved smoke detector or other device shall be provided to automatically and instantaneously stop the exhaust fan in the presence of smoke as required in section 605.2. The louvres provided for the transmission of air to and from air-conditioned spaces to such corridors shall be arranged to automatically close after stopping of the fans and shall be equipped with auxiliary manually-operated closing devices.

## **SECTION 1815.0. RESTAURANT COOKING EQUIPMENT**

**1815.1. Exhaust System.**—An independent exhaust system shall be provided to exhaust the grease-laden vapors and fumes from restaurant type equipment and appliances, such as ranges, deep-fat fryers, grills, broilers, candy kettles, and ovens. The system shall consist of hoods, fire-extinguishing systems, exhaust fans, ductwork, and filters or other approved devices to extract grease from the exhaust in accordance with reference standard RS 18-5.

**1815.2. Non-Grease System.**—Where restaurant type equipment is installed and is used only for warming, where no frying or grilling is done, and where no grease-laden vapors can be generated, hoods, filters, and automatic extinguishing systems shall not be required and the ductwork may be constructed as required in reference standard RS 18-4.

**1815.3. Posting.**—Clear, concise, and complete operating and cleaning instructions covering all components of the exhaust system shall be permanently posted outside the main entrance or other suitable entrance to the kitchen.

## **SECTION 1816.0. ROOF-MOUNTED APPLIANCES**

**1816.1. General.**—

- a. Appliances shall be listed for outdoor installation or shall be designed to withstand atmospheric and climatic conditions in the areas in which they are to be installed.
- b. Roofs on which appliances are to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load.
- c. All access locks, screws and bolts shall be of corrosion-resistant material.

**1816.2. Installation.**—

- a. Appliances shall be installed in accordance with their listings and in accordance with the manufacturer's installation instructions.
- b. Appliances shall be installed on a well-drained surface. At least six (6) feet clearance shall be available between the appliance and the edge of a roof or similar hazard; or rigidly fixed rails or guards at least three (3) feet in height shall be provided on the exposed side except that parapets or other building structure at least three (3) feet in height may be utilized in lieu of rails or guards.

- c. Each appliance shall have an accessible disconnect switch and a 110-120 volt a-c grounding type convenience outlet on the roof near the appliance. The convenience outlet shall be on the supply side of the disconnect switch.
- d. When water stands on the roof at the appliance or in the passageways to the appliance, or when the roof is of a design having a water seal, a suitable platform or walkway or both shall be provided above the water line.

### **1816.3. Access to Appliances. —**

- a. Appliances located on roofs or other elevated locations shall be accessible.
- b. Buildings of more than one story in height shall have an inside means of access to the roof.
- c. The inside means of access shall be a permanent, or foldaway, inside stairway or ladder, terminating in an enclosure, scuttle or trap door. Such scuttles or trap doors shall be at least 24 inches by 24 inches in size, and shall open easily and safely under all conditions, especially snow, and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.

At least six (6) feet clearance shall be available between the access opening and the edge of the roof or similar hazard, or rigidly fixed rails or guards at least three (3) feet in height shall be provided on the exposed side except that parapets or other building structure at least three (3) feet in height may be utilized in lieu of guards or rails.

- d. Proper permanent lighting shall be provided at the roof access. The switch for such lighting shall be located inside the building near the access means leading to the roof.

**1816.4. Protection from the Weather. —**When climatic or safety conditions warrant, protection from the weather shall be provided either by the design of the appliance itself or by an enclosure. This enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least two (2) feet of clearance to either side of the service access panel of the appliance.



## REFERENCE STANDARD RS 18 AIR CONDITIONING, REFRIGERATION AND MECHANICAL VENTILATION

### List of Reference Standards

ANSI B9.1 1964  
Safety Code for Mechanical Refrigeration

NFPA 90A 1969  
Air Conditioning and Ventilating Systems

NFPA 90B 1968  
Warm Air Heating and Air Conditioning Systems,  
Residence Type

NFPA 96 1969  
Ventilation of Cooking Equipment

Note: Wherever in these standards reference is made to the "National Electric Code", the work so covered shall meet the requirements of the Massachusetts Electric Code.

RS 18-1 ANSI B9.1 1964  
Safety Code for Mechanical Refrigeration

RS 18-2 NFPA 90A 1969  
Air Conditioning and Ventilating Systems

MODIFICATIONS.—The provisions of NFPA 90A 1969 shall be subject to the following modification. The section and paragraph number is from that standard.

Add the following new paragraph:

**104. Smoke Removal.**—In a ventilating system, and in an air conditioning system that contains provisions for ventilating, the damper controls for outdoor air intake, discharge and return shall be arranged so that they can be manually adjusted to permit the system

to be operated to remove smoke and heat from a space at the maximum ventilating rate for which the system was designed. When used to remove smoke and heat, such systems shall be operated by qualified personnel and then only at the direction of the firemen fighting the fire. Instructions for operating such dampers shall be mounted with the damper controls and clearly labeled "operating instructions for smoke removal." Where fan cut-off interlocks or devices are used, the instruction shall list each interlock and device and shall describe the operating procedure to make the system operative. Automatically operated smoke removal systems may be used, subject to the approval of the building official.

RS 18-3 NFPA 90B 1968  
Warm Air Heating and Air Conditioning Systems,  
Residence Type

RS 18-4  
Exhaust Systems for Cooking Spaces

1. CONSTRUCTION.—Exhaust systems for cooking spaces shall be separate systems that may exhaust a number of such spaces. The ductwork shall be constructed as required by reference standard RS 18-2, with the following modifications:

- a. Hoods and ducts shall be of galvanized steel and the minimum gage shall be as follows:
  1. In all buildings other than those classified as residential occupancy, a minimum of no. 16 galvanized sheet gage shall be used.
  2. In residential occupancies other than one- and two-family dwellings a minimum of no. 18 galvanized sheet gage shall be used.
  3. In one- and two-family dwellings the gages shall be as required in reference standard RS 18-3 for supply ductwork.



- b. Where branch ductwork is to be used to exhaust vapors from dishwashers, pot sinks, or other similar equipment of a commercial type from which moisture is emitted, copper or aluminum of the minimum gages and weights required in reference standard RS 18-2, or other equivalent moisture and corrosion resistant metals, shall be used. Such ductwork shall be installed so that condensate cannot leak from it.
- c. In residential occupancies other than one- and two-family dwellings, an approved fusible link register may be used in lieu of fire dampers for ducts in shafts or which terminate in shaft walls.

RS 18-5 NFPA 96 1969  
Ventilation of Cooking Equipment

MODIFICATIONS.—The provisions of NFPA No. 96 1969 shall be subject to the following modifications. The section and paragraph numbers are from that standard.

311. Delete this paragraph and substitute the following: “The hood or that portion of a primary collection means designed for collecting cooking vapors and residues shall be constructed of and be supported by steel or stainless steel not lighter than No. 18 Manufacturers Standard Gage or of other approved material of equivalent strength, fire, and corrosion resistance.”

4121. Delete this paragraph and substitute the following: “Materials. Ducts shall be constructed of and supported by steel or stainless steel not lighter than No. 16 Manufacturers Standard Gage.”

4122. (a.) Add to Note: “Expansion joints shall be UL rated non-combustible and UL rated non-absorbent.”

4123. (b.) Add to Note: “Expansion joints shall be UL rated non-combustible and UL rated non-absorbent.”

Appendix B. Add:

(7) 2 inch solid or 3 inch hollow gypsum block . . .  
2 inches.



**PREFABRICATED CONSTRUCTION**

1900.0	Scope	1911.0	Light Wood Frame Construction
1901.0	Definitions	1912.0	Light Reinforced Concrete Frame Construction
1902.0	Plans and Specifications	1913.0	Omitted
1903.0	Tests of Prefabricated Assemblies	1914.0	Fire-resistance and Fire-stopping
1904.0	Inspection and Certificate of Supervision	1915.0	Light and Ventilation
1905.0	Prefabricated Units	1916.0	Egress Facilities
1906.0	Existing Systems and Approvals	1917.0	Plumbing, Piping and Sanitary Equipment
1907.0	Approvals Based on Design	1918.0	Heating and Air Conditioning
1908.0	Approvals Based on Tests	1919.0	Electric Wiring and Equipment
1909.0	Materials, Dimensions and Methods of Fabrication		
1910.0	Light Gage Steel Frame Construction		

**SECTION 1900.0. SCOPE**

The provisions of this article shall govern the materials and methods of construction of all prefabricated buildings, prefabricated subassemblies and prefabricated building units as herein defined. Prefabrication as herein used is not restricted to housing for one- and two-family dwellings, but applies to all prefabricated forms of building elements and assembled construction units intended for both structural and service equipment purposes in all buildings of all use groups. The provisions of this article are supplemental to the structural, mechanical and fire-resistive requirements of this Code. Prefabrication covers the pre-cutting and assembling of individual elements either in the shop or at the site before erection in the building structure. Prefabricated shop assemblies may be shipped in structurally complete units ready for installation in the building structure or in knock-down and packaged form for assembly at the site.

**1900.1. Approved Materials and Methods.**—The use of all materials or methods of construction which meet the specified strength, durability and fire-resistive requirements of this Code shall be permitted.

**1900.2. New Materials.**—All new materials not specifically provided for shall be tested and approved in accordance with the provisions of articles 8 and 9 for strength, durability and

fireresistance; or the building official may accept the reports of accredited testing authorities complying with the approved rules to assist him in his determination.

**1900.3. At-Site Construction.**—Nothing in these provisions shall be deemed to prohibit at-site construction and erection of buildings or structures when designed in compliance with the provisions of this Code and the minimum requirements prescribed in this article.

**1900.4. Conflicting Laws.**—Nothing herein contained shall be deemed to nullify any provisions of the zoning laws or any other statute or legally adopted rule pertaining to building construction of the City of Boston, Massachusetts in respect to the location, use, height, area of building and type of construction except as may be specifically exempted in these provisions; nor have the effect to increasing working stresses or reducing exit facilities and provisions as prescribed in this Code.

## **SECTION 1901.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see section 201.

## **SECTION 1902.0. PLANS AND SPECIFICATIONS**

Complete legible dimensioned drawings to a scale of not less than one-eighth (1/8) inch per foot and specifications covering every type of prefabricated construction complying with the administrative provisions of Part I section 110 shall be submitted to the building official for approval. Such application shall describe all essential elements of the structure or assembly, identify such materials as the building official may designate with the name of manufacturer, trade name, commercial grade, manufacturing process or chemical composition when necessary, and shall include all required data of the physical properties of the component materials.

**1902.1. Plot Diagram.**—A plot plan complying with Part I Section 110(f) shall be filed for each individual building or structure.

**1902.2. Mechanical Plans.**—Mechanical plans in sufficient detail for the installation of heating, cooking, electrical, ventilating, air-conditioning, sanitary and all other service equipment, piping and accessories shall be submitted to the building official with the

application for general approval of the design; or, if not included in the general application for approval, such information shall be furnished for each specific installation.

**1902.3. Piping, Electric Wiring and Accessories.**—The design shall include provision for all installations of piping, wiring and accessories for service equipment to be installed either in the shop or at the site.

**1902.4. Integral Accessories.**—When unit service equipment is furnished with and forms an integral part of the prefabricated subassembly, the construction shall be performed to accommodate accessory conduits, piping, ducts, outlet boxes and fittings; and no material essential to the structural strength of the unit or assembly shall thereafter be removed from structural elements during installation on the site.

**1902.5. Service Equipment Requirements.**—All service equipment shall comply with the requirements of this Code.

## **SECTION 1903.0. TESTS OF PREFABRICATED ASSEMBLIES**

When not capable of design by accepted engineering analysis, all prefabricated assemblies or subassemblies constructed as in practice shall be subjected to the unit assembly tests prescribed in articles 7 and 8. All assembly tests shall meet the strength requirements of section 804 within the limits of deflection therein provided.

## **SECTION 1904.0. INSPECTION AND CERTIFICATE OF SUPERVISION**

**1904.1. Verified Report.**—Except where all assemblies and subassemblies, service equipment and accessories are readily accessible for complete inspection at the site, the licensed professional engineer or architect who supervised the design, fabrication and erection of the prefabricated construction, or the authorized and qualified representative of the manufacturer, shall furnish a verified report of inspection to the building official upon completion of the work certifying that the building has been erected in accordance with this Code, and that the work has been constructed in conformity to the approved plans except as to specific legally authorized variations which are noted in the verified report.

**1904.2. Test and Inspection Records.**—All required test and inspection records shall be accessible to the building official at all times during the fabrication of the unit or subassembly and the erection of the building; or such records as the building official may designate shall be filed with him.

## **SECTION 1905.0. PREFABRICATED UNITS**

Approved prefabricated individual units for use in floor, roof, ceiling or wall construction which are designed to meet all prescribed structural provisions of articles 7 and 8 including connection and anchorage details may be used in all at-site construction types and building use groups within the height, area and fireresistance limitations of tables 2-1 and 2-2 in article 2.

## **SECTION 1906.0. EXISTING SYSTEMS AND APPROVALS**

**1906.1. Existing Approvals.**—Any material, appliance, form or system of construction heretofore legally approved may be used for the purposes and within the limitations for which it was approved, provided such use is not detrimental to the safety of the public or is not specifically prohibited by the provisions of this Code.

**1906.2. Materials Already Fabricated.**—The use of any material already fabricated or of any construction already erected under a heretofore legally issued permit of the building official shall be permitted; but the continuation of any construction erected in violation of any statute or legally adopted rule in force at the time of erection shall be prohibited.

## **SECTION 1907.0. APPROVALS BASED ON DESIGN**

When capable of design by accepted engineering analysis, any prefabricated structural element or combination of elements shall be approved by the building official when the design is based on the working loads and working stresses provided in articles 7 and 8.

**1907.1. Ordinary Materials.**

**1907.1. Average Working Stresses.**—When the character of construction permits site inspection by the building official, and all prefabricated assemblies and sub-assemblies are readily accessible

for field inspection, the use of ordinary material with the average working stresses prescribed in article 7 shall be permitted in prefabricated construction.

**1907.1.2. Field Inspection.**—When ordinary materials are used, field erection and installation of prefabricated units and service equipment at the site shall be inspected by the building official or he may accept the report of a qualified licensed engineer or architect in respect thereto. All prefabricated subassemblies shall be certified by the authorized representative of the manufacturer for compliance with this Code.

**1907.2. Expert Services.**—When a system of construction involves unusually intricate design analysis, the building official may require the submitter to retain a competent expert to assist in his determination; or he may accept the recommendations of the Building Officials Conference of America in respect thereto.

**1907.3. Check Tests.**—When there is reasonable doubt as to the adequacy of the construction or accessory details which are based on design, the building official may require check tests of assembled units as specified in section 702.2 or he may accept certified reports of such tests from accredited testing authorities.

## **SECTION 1908.0. APPROVALS BASED ON TESTS**

When not capable of design by accepted engineering analysis, every system of prefabricated building, subassembly or unit and its connections shall be subjected to the tests and conditions of approval prescribed by article 8 or to any other tests acceptable to the building official that simulate the actual loads and conditions of application that the completed structure will be required to resist in normal use; or certified reports of such tests conducted by an approved and recognized testing authority shall be accepted by the building official provided such tests meet the requirements of this Code. The costs of all investigations and tests shall be paid by the submitter.

**1908.1. Field Connections.**—All field splices and structural connections of floor, wall, ceiling and roof sub-assemblies shall be of sufficient strength to transmit the loads specified for full sized tests in the applicable Reference Standard for the material or a load equal to two (2) times the design live load plus one and one-half (1-1/2) times the dead load it will carry when in place.

**1908.2. Weather Resistance.**—In the absence of reliable experience records, the building official may require accelerated tests on the prefabricated assemblies as prescribed by article 8 to determine durability, weather tightness and weather resistance; or he may accept certified reports of approved and recognized testing authorities in respect thereto.

**1908.3. Comparative Tests.**—When not available from existing authoritative test data, the building official may require comparative tests of traditional standard construction of the dimensions and proportions required in this Code for the proposed use.

## **SECTION 1909.0. MATERIALS, DIMENSIONS AND METHODS OF FABRICATION**

**1909.1. Accepted Standards.**—The provisions of articles 7 and 8 shall control the selection of materials, design and fabrication of all prefabricated structures; or in the absence of such standards of accepted engineering practice, the minimum requirements shall be regulated by the approved rules.

**1909.2. Below-Grade Construction.**—The prefabricated construction covered by these provisions shall not be permitted in cellar, basement or part-story below grade unless specifically approved by the building official. All such subsurface structures shall be constructed of approved masonry, or reinforced concrete complying with article 8; or the subgrade walls and floors shall be constructed of approved durable, water-resisting materials of adequate strength.

**1909.3. Exterior and Interior Finish.**—When fireresistance is specified, framed wall and partition assemblies shall be veneered, surfaced or constructed with approved materials to secure the specified fireresistance rating required by article 2 for the construction type and occupancy group of the building or structure within the limitations of tables 2-1 and 2-2. When not required to meet fireresistance requirements, interior wall and partition surfaces shall be constructed to comply with section 855.9.

**1909.4. Exterior Protection.**—All steel or other corrodible siding and weather boarding exposed to the weather shall be protected from corrosion or shall be manufactured from corrosion-resistive metal to comply with section 855. In structures two (2) stories or more in height, the weather boarding shall be constructed of noncombustible or approved protected-combustible materials as regulated by tables 2-1 and 2-2 in article 2.



**1909.5. Condensation and Weather Resistance.**—Exterior frame walls of buildings shall be constructed or ventilated to avoid condensation and leakage of moisture to comply with section 855.8.

**1909.6. Roofing.**—All roof covering shall be of approved types meeting the requirements of sections 903.4 and 928.

**1909.7. Connections.**—All connections and accessories shall be proportioned to transmit the loads and stresses imposed in accordance with approved engineering practice standards or as provided in section 1908.1.

**1909.8. Waterproofing, Ratproofing, and Termite Protection.**—All installations shall comply with the provisions of sections 874 for waterproofing, 875 for ratproofing and 876 for termite protection.

## **SECTION 1910.0. LIGHT GAGE STEEL FRAME CONSTRUCTION**

The fabrication of light gage steel structures shall comply with the requirements of section 828 governing formed steel and 829 governing steel joists.

## **SECTION 1911.0. LIGHT WOOD FRAME CONSTRUCTION**

The fabrication of light wood frame structures shall comply with the requirements of section 855.

## **SECTION 1912.0. LIGHT REINFORCED CONCRETE FRAME CONSTRUCTION**

The fabrication of light reinforced concrete frame structures shall comply with the provisions of sections 841 to 849 inclusive.

**1912.1. Shop Procedure and Test Reports.**—The design and manufacture of all precast concrete structural units and assemblies shall follow the procedures specified for ordinary or controlled materials. Tests shall be made at the place of manufacture to determine the water-ratio and the aggregate proportions required to maintain the design strength for every change in material and manufacturing conditions. The shop report shall cover the quality of concrete materials and the total amount of water used; the mixing and placing of concrete and the installation of

reinforcement, together with a record of the temperatures and means of protection provided for the concrete while curing.

**1912.2. Test Cylinders.**—Not less than three (3) compression specimens shall be tested at the age of shipment of the prefabricated member for each one hundred (100) cubic yards of concrete. The test cylinders shall develop on average compressive strength at the age of shipment of the prefabricated member of not less than twice the compressive stress used in the design.

## **SECTION 1913.0. OMITTED**

## **SECTION 1914.0. FIRERESISTANCE AND FIRESTOPPING**

Provision shall be made to comply with all the requirements of sections 877 and 921 for fire protection and firestopping and the provisions for fireresistive construction of article 9.

## **SECTION 1915.0. LIGHT AND VENTILATION**

Means of light and ventilation shall comply with the provisions of article 5 governing habitable and occupiable rooms, bathrooms and toilet rooms, attic and crawl spaces.

## **SECTION 1916.0. EGRESS FACILITIES**

The requirements of article 6 shall control the number, size and construction of all means of egress as specified therein for the use and occupancy of the building.

**1916.1. Fireresistance Requirements.**—Where fireresistive construction is required, fireresistance ratings shall be regulated by table 2-1 for the respective type of construction. Required exitways, public hallways, interior trim and finish shall be constructed to comply with article 9.

## **SECTION 1917.0. PLUMBING, PIPING AND SANITARY EQUIPMENT**

All installations of plumbing, drainage and gas-piping systems shall comply with the provisions of article 17.

**SECTION 1918.0. HEATING AND AIR CONDITIONING**

The applicable provisions of articles 10 and 11 and the standards of accepted engineering practice listed in reference standards shall control the construction and installation of chimneys, flues and heating appliances as therein provided for liquid and solid fuel and gas-fired heating equipment and service-water heaters; and the provisions of article 18 for air-conditioning installations.

**SECTION 1919.0. ELECTRIC WIRING AND EQUIPMENT**

All electric conductors, equipment, wiring and outlets for electric appliances shall be installed in accordance with the provisions of article 15.



## LIGHT TRANSMITTING PLASTIC MATERIALS

2000.0	Scope	2006.0	Skylight Assemblies
2001.0	Definitions	2007.0	Light Diffusing Systems
2002.0	Design and Installation	2008.0	Plastic Light Diffusers in Electrical Fixtures
2003.0	Glazing of Unprotected Openings	2009.0	Partitions
2004.0	Exterior Wall Panels	2010.0	Plastic Glazing in Bathrooms
2005.0	Roof Panels	RS 20	Reference Standards

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- 20-1 2004.1.1. Area Limitation and Separation Requirements for Plastic Wall Panels
- 20-2 2005.3.1. Area Limitations for Plastic Roof Panels

## SECTION 2000.0. SCOPE

The provisions of this article shall govern the quality and methods of application of plastics for use as light transmitting materials in buildings and structures. When used as interior finish, plastic materials shall meet the requirements of Section 922.

**2000.1. Approved Materials.**—The use of all light transmitting plastics which meet the requirements as set forth below and which meet the strength, durability and sanitary requirements of this Code shall be permitted subject to the limitations of this article.

- a. burns no faster than two and one-half (2 ½) inches per minute in sheets sixty one-thousandths (60/1000) of an inch in thickness when tested in accordance with reference standard RS 20-1 (thickness shall be determined in accordance with the methods of reference standard RS 20-2); and
- b. has a smoke density rating of seventy-five (75) or less when tested in the thickness intended for use in accordance with reference standard RS 20-3; and
- c. the products of combustion are not more toxic in point of concentration than those of wood or paper burned under similar conditions.

**2000.1.1. Application for Approval.**—Applicants for approval of a plastic material shall furnish all necessary technical data required by the building official. The data may include the chemical composition; pertinent physical, mechanical, and thermal properties such as fireresistance, flammability, and flame-spread; weather resistance; electrical properties; products of combustion and coefficients of expansion.

**2000.2. Identification.**—All plastic materials approved for use under this Code shall be identified by the trade formula number or name or other acceptable identification. Each unit or package shall bear the approval number or other identification mark of the approving authority.

**2000.3. Classification.**—Plastics used in this article shall be classified in accordance with reference standard RS 20-2, as:

- a. Class SE - Plastic materials which are self-extinguishing.
- b. Class SB - Plastic materials which have a burning rate of less than 2.5 inches per minute.
- c. Class VSB - Plastic materials which have a burning rate less than 0.8 inches per minute.

## **SECTION 2001.0. DEFINITIONS**

For definitions to be used in the interpretation of this article, see Section 201.

## **SECTION 2002.0. DESIGN AND INSTALLATION**

**2002.1. Structural Requirements.**—All plastic materials and their assemblies shall be of adequate strength and durability to withstand the loads and forces specified in article 7 for their approved use.

**2002.2. Connections and Supports.**—All fastenings, connections and supports shall be proportioned to safely transmit two and one-half (2-1/2) times the design live load. Adequate allowance shall be made in the fastenings and supports for differential expansion and contraction of the connected materials.

## **SECTION 2003.0. GLAZING OF UNPROTECTED OPENINGS**

Openings not required by section 916 to be fire protected may be glazed or equipped with approved plastic materials subject to the following limitations:

**2003.1. Area.**—The area of such glazing shall not exceed twenty-five (25) percent of the wall face of the story in which it is installed.

**2003.2. Above First Story.**—The area of a unit or pane of glazing installed above the first story shall not exceed twelve (12) square feet and the vertical dimension of the unit or pane shall not exceed four (4) feet. There shall be a minimum of three (3) feet vertical spandrel between stories.

**2003.3. Exceptions.**

**2003.3.1. Automatic Venting.**—Installations of approved thermoplastic materials which will automatically vent a fire prior to ignition of the plastic materials may occupy a maximum of fifty (50) percent of the area of the wall face and the story when installed in the first three (3) stories above grade.

**2003.3.2. Fire Canopies.**—Approved thermoplastic materials may be installed in up to fifty (50) percent of the wall area of each story in structures less than one hundred and fifty (150) feet in height which are provided on each floor above the first with continuous architectural projections constituting an effective fire canopy extending at least three (3) feet from the surface of the wall in which the glazing is installed. The size and the dimensions of individual units shall not be limited in such installations except as required to meet the structural loading requirements.

**2003.3.3. Automatic Sprinkler Allowance.**—In buildings provided with complete automatic fire sprinkler protection, the area of plastic glazing permitted by 2003.1 may be increased by fifty percent (50%).

**2003.4. Special Occupancy and Type Construction Requirements.**

**2003.4.1. Type 4-B Construction.**—Doors, sash and framed openings which are not required to be fire protected by section 916 may be glazed with approved plastic materials in buildings of type 4-B construction.

**2003.4.2. Occupancy Group D.**—In all types of construction of Occupancy Group D, doors, sash and framed openings which are not required to be fire protected by section 916 may be glazed with approved plastic materials.

## **SECTION 2004.0. EXTERIOR WALL PANELS**

Approved plastic materials may be used as wall panels in exterior walls not required to have a fireresistive rating by

table 2-1, except in Occupancy Groups A, F-1a, F-1b, and H, subject to the following conditions:

**2004.1. Area Limitation and Separation.**—Area limitation and separation requirements of exterior wall panels shall be provided in table 20-1.

**2004.1.1. Table 20-1.**—Area limitation and separation requirements for plastic wall panels\*

Fire separation (ft.)	Class of plastic	Max. % area exterior wall in plastic panels	Max. sq. ft. single area	Minimum separation of panels (ft.)	
				Vertical	Horizontal
6 ft. or less	—	not permitted	—	—	—
More than 6 ft. but less than 11 ft.	SE SB VSB	10 not permitted	50 —	8 —	4 —
11 ft. or more but less than 30 ft.	SE SB VSB	25 15 50	90 70 not limited	6 8 3**	4 4 0
30 ft. and over	SB	50	100	6**	3

\*See section 2004.4 for combination of glazing and wall panel permitted.

\*\*See section 2004.3.1.

**2004.2. Spandrel Separation.**—Vertical spandrel wall separation between stories shall be as follows:

Three (3) feet for SE and VSB plastic wall panels

Four (4) feet for SB plastic wall panels

**2004.3. Exceptions.**

**2004.3.1. Fire Canopies.**—In structures which are provided, on any floor above the first, with continuous architectural projections constituting an effective fire canopy extending at least three (3) feet from the surface of the wall in which plastic panels are installed, there need be no vertical separation at that floor except that provided by the vertical thickness of the projection.

**2004.3.2. Automatic Sprinkler Allowance.**—When complete automatic fire sprinkler protection is provided in the building the maximum percent area of exterior wall in plastic panels and the maximum square feet of single area required in table 20-1



may be increased fifty (50) percent, but in no case shall the area of plastic wall panels exceed fifty (50) percent of the wall area.

**2004.4. Combinations of Glazing and Wall Panels.**—Combinations of plastic glazing and plastic wall panels shall be subject to the area, height, percentage limitations and separation requirements applicable to the class of plastics as prescribed for wall panel installation.

**2004.5. Classification.**—Exterior wall panels installed as provided in this section shall not change the type-of-construction classification of the building as defined in Article 2.

## SECTION 2005.0. ROOF PANELS

Approved plastic roof panels may be installed (except in use groups A, F-1a, F-1b, F-2, F-3, and H) as follows:

- a. In roofs of buildings protected by complete automatic sprinklers; or
- b. Where the roof is not required to have a fire-resistance rating by table 2-1.

Roof panels shall meet the requirements of Section 302.6 Roof Coverings, 903.5 Classification of Roof Coverings, and 928 Roof Coverings, except when installed on buildings outside the First and Second Fire District.

**2005.1. Separations.**—Individual roof panels shall be separated from each other by a distance of not less than four (4) feet measured in a horizontal plane.

**2005.2. Location.**—Where exterior wall openings are required to be fire protected by Section 916, no roof panel shall be installed within six (6) feet of such exterior wall.

**2005.3. Area Limitations.**—Roof panels shall be limited in area and the aggregate area of panels shall be limited by a percentage of the floor area of the room or space sheltered in accordance with Table 20-2.

**2005.3.1. Table 20-2.**—Area limitations for plastic roof panels

Class of Plastic	Maximum Area Individual Panel (sq. ft.)	Maximum Aggregate Area (% of floor area)
SE	300	30
VSB	200	25
SB	100	20

### **2005.3.2. Exceptions. —**

- a. One story buildings not more than sixteen (16) feet in height and not exceeding twelve hundred (1200) square feet in area and not closer than eleven (11) feet to another building are exempt from the limitations of section 2005.3.
- b. Low hazard uses such as swimming pool shelters, greenhouses, are exempt from the area limitations of Section 2005.3 provided they do not exceed twenty-four hundred (2400) square feet in area, twenty (20) feet in height and are not closer than eleven (11) feet to the property line or adjacent buildings.
- c. Roof coverings over terraces and patios of one- and two-family dwellings shall be permitted with approved plastics.

## **SECTION 2006.0. SKYLIGHT ASSEMBLIES**

Skylight assemblies may be glazed with approved plastic materials (except in Occupancy Group A) in accordance with the following provisions: (Roof panels shall meet requirements of Section 2005.0.)

**2006.1. Mounting.**—The plastic shall be mounted above the plane of the roof on a curb constructed consistent with the requirements for the type-of-construction classification.

**2006.2. Maximum Area of Skylight Units.**—Each skylight unit shall have a maximum area within the curb of one hundred (100) square feet.

**2006.3. Aggregate Area of Skylights.**—The aggregate area of skylights shall not exceed twenty-five (25) percent of the floor area of the room or space sheltered by the roof in which they are installed.

**2006.3.1. Automatic Sprinkler Allowance.**—Except for Occupancy Groups A and H, the aggregate area of approved plastic skylights may be increased one hundred (100) percent beyond the limitations set forth in section 2006.3. if the building is equipped with a complete automatic fire sprinkler system.

**2006.4. Separation.**—Skylights shall be separated from each other by a distance of not less than four (4) feet measured in a horizontal plane.

**2006.5. Location.**—Where exterior wall openings are required by section 916 to be fire protected, no skylight shall be installed within six (6) feet of such exterior wall.

**2006.6. Combinations of Roof Panels and Skylights.**—Combinations of plastic roof panels and skylights shall be subject to the area, percentage limitations and separation requirements applicable to roof panel installations in section 2005.

**2006.7. Plastic Domes.**—Approved plastic domes may be placed over stair enclosures if they are constructed in a manner that will allow them to open and remain open when a thermal releasing device set at not more than one hundred eighty (180) degrees F. releases. The releasing device and opening mechanism shall operate automatically, independent of electrical power or any other energy sources that may be interrupted during a fire.

## **SECTION 2007.0. LIGHT-DIFFUSING SYSTEMS**

Approved plastic light-diffusing systems shall be installed in accordance with the following requirements:

**2007.1. Prohibited Installations.**—Plastic light-diffusing systems shall not be installed in elevators, exitways nor in Occupancy Groups A and H.

**2007.2. Installation.**—Approved plastic diffusers shall comply with Section 922 or be mounted or supported in such a manner that they will not become readily detached when exposed to an ambient room temperature of one hundred seventy-five (175) degrees F. for a period of fifteen minutes, but will fall free from the mountings at an ambient temperature of at least two hundred (200) degrees F. below the self-ignition temperature of the plastic material when tested in accordance with reference standard RS20-4.

**2007.3. Size Limitations.**—Individual panels or units shall not exceed ten (10) feet in length.

**2007.4. Sprinklers.**—In buildings having a complete automatic sprinkler system, plastic light-diffusing systems shall have sprinklers both above and below, unless the system has been specifically approved for sprinkler installation only above the light-diffusing system.

## **SECTION 2008.0. PLASTIC LIGHT DIFFUSERS IN ELECTRICAL FIXTURES**

Plastic light diffusers made from approved plastic shall be accepted for use as light diffusers in lighting fixtures in all

occupancy groups when installed in compliance with the following requirements:

**2008.1. Installation.**—Approved plastic light diffusers shall comply with section 922 or be mounted or supported in such a manner that they will not become readily detached when exposed to an ambient room temperature of one hundred seventy-five (175) degrees F. for a period of fifteen minutes; but will fall free from the fixture at an ambient temperature of at least two hundred (200) degrees F. below the self-ignition temperature of the plastic material when tested in accordance with reference standard RS20-4.

**2008.2. Size Limitations.**—Individual panels or units shall not exceed ten (10) feet in length.

**2008.3. Limited Installations.**—Fixtures may be installed in the following locations provided the aggregate area of the plastic light diffusers does not exceed thirty (30) percent of the total area of the surface to which the fixtures are attached or in which they are installed:

a. Required means of egress including lobbies.

b. Occupancy Groups A, F-1a, F-1b, F-2, F-3, and H.

**2008.4. Prohibited Installations.**—Plastic light diffusers in electrical fixtures shall not be permitted in elevators.

## **SECTION 2009.0. PARTITIONS**

Approved plastic partitions may be installed as provided in section 910.4.

## **SECTION 2010.0. PLASTIC GLAZING IN BATHROOMS**

Approved plastics which conform to reference standard RS 20-5 shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures, and similar accessory units.

## REFERENCE STANDARD RS 20 LIGHT TRANSMITTING PLASTIC MATERIALS

### List of Reference Standards

ANSI Z97.1 1966  
Performance Specifications and Methods of Test for  
Transparent Safety Glazing Material Used in Buildings

ASTM D374 1968  
Tests for Thickness of Solid Electrical Insulation

ASTM D635 1968  
Test for Flammability of Self Supporting Plastics

ASTM D1929 1968  
Test for Ignition Properties of Plastics

NFPA Q57-9 1968  
Chamber method of test specified in NFPA Quarterly,  
January 1, 1964, pp 276-287, also available as:

(ASTM D2843 1970  
Standard Method of Test for Measuring the Density  
of Smoke from the Burning or Decomposition of  
Plastics)

**RS 20-1** ASTM D635 1968  
Test for Flammability of Self Supporting Plastics

**RS 20-2** ASTM D374 1968  
Tests for Thickness of Solid Electrical Insulation

**RS 20-3** NFPA Q57-9 1968  
Chamber method of test specified in NFPA Quarterly,  
January 1, 1964, pp. 276-287, also available as:

(ASTM D2843 1970  
Standard Method of Test for Measuring the Density  
of Smoke from the Burning or Decomposition of  
Plastics)

**RS 20-4** ASTM D1929 1968  
Test for Ignition Properties of Plastics

**RS 20-5** ANSI Z97.1 1966  
Performance Specifications and Methods of Test for  
Transparent Safety Glazing Material Used in Buildings







**ACCREDITED AUTHORITATIVE AGENCIES LISTED IN  
REFERENCE STANDARDS**

- AA           The Aluminum Association  
420 Lexington Avenue  
New York, New York 10017
- AASHO       American Association of State Highway Officials  
341 National Press Building  
Washington, D.C. 20004
- ACGIH       American Conference of Governmental Industrial  
              Hygienists  
Committee on Industrial Ventilation  
P. O. Box 453  
Lansing, Michigan 48902
- ACI           American Concrete Institute  
P. O. Box 4754  
Redford Station  
Detroit, Michigan 48219
- AIA           American Insurance Association  
85 John Street  
New York, New York 10038
- AISC         American Institute of Steel Construction Inc.  
101 Park Avenue  
New York, New York 10017
- AISI         American Iron and Steel Institute  
150 East 42nd Street  
New York, New York 10017
- AITC         American Institute of Timber Construction  
1700 K Street, N.W.  
Washington, D.C. 20006
- ANSI         American National Standards Institute  
(formerly: United States of American Standards  
              Institute/American Standards Association)  
1430 Broadway  
New York, New York 10018

- APA American Plywood Association  
1119 A Street  
Tacoma, Washington 98401
- APHA American Public Health Association  
1790 Broadway  
New York, New York 10019
- AREA American Railway Engineering Association  
59 East Van Buren Street  
Chicago, Illinois 60605
- ASCE American Society of Civil Engineers  
United Engineering Center  
345 East 47th Street  
New York, New York 10017
- ASHRAE American Society of Heating, Refrigerating and  
Air Conditioning Engineers  
United Engineering Center  
345 East 47th Street  
New York, New York 10017
- ASME The American Society of Mechanical Engineers  
United Engineering Center  
345 East 47th Street  
New York, New York 10017
- ASTM American Society for Testing and Materials  
1916 Race Street  
Philadelphia, Pennsylvania 19103
- AWPA American Wood Preservers' Association  
1012 Fourteenth Street N.W.  
Washington, D.C. 20005
- AWS American Welding Society  
345 East 47th Street  
New York, New York 10017
- IBI Insulation Board Institute  
111 West Washington Street  
Chicago, Illinois 60602
- ICBO International Conference of Building Officials  
50 South Las Robles  
Pasadena, California 91101

IIA Incinerator Institute of America  
60 East 42nd Street  
New York, New York 10017

Mass - FPR Massachusetts Fire Prevention Regulation  
1010 Commonwealth Avenue  
Boston, Massachusetts

Mass - DPS Massachusetts Department of Public Safety  
1010 Commonwealth Avenue  
Boston, Massachusetts

NCMA National Concrete Masonry Association  
New England Division  
527 Statler Building  
20 Providence  
Boston, Massachusetts

NFPA National Fire Protection Association  
60 Batterymarch Street  
Boston, Massachusetts

NFoPA National Forest Products Association  
Technical Services Division  
1619 Massachusetts Avenue N.W.  
Washington, D.C. 20036

SCPI Structural Clay Products Institute  
1750 Old Meadow Road  
McLean, Virginia 22101

SJI Steel Joist Institute  
2001 Jefferson Davis Highway  
Arlington, Virginia 22202

UL Underwriter's Laboratories, Inc.  
207 East Ohio Street  
Chicago, Illinois 60611

US (Federal Specifications)  
(Federal Test Method Standard)

USDC (Department of Commerce)

US FHA (Federal Housing Administration)  
Superintendent of Documents  
Government Printing Office  
Washington, D. C. 20402

VI Vermiculite Institute  
208 South La Salle Street  
Chicago, Illinois 60604



**CODE REVISION PROPOSAL FORM**

Building Code  
Section \_\_\_\_\_

Proponent (Name) \_\_\_\_\_

(Address) \_\_\_\_\_

Give here the specific statement of the proposed code change, with the exact rewording proposed. Show material in brackets [ ] to be deleted from present text. Show material underscored \_\_\_ to be added to or substituted for present text.

This is a sample form.

It is anticipated that the use of this code will reveal the need for revision. Recommendations for specific changes should be made on the form available at the Building Department.

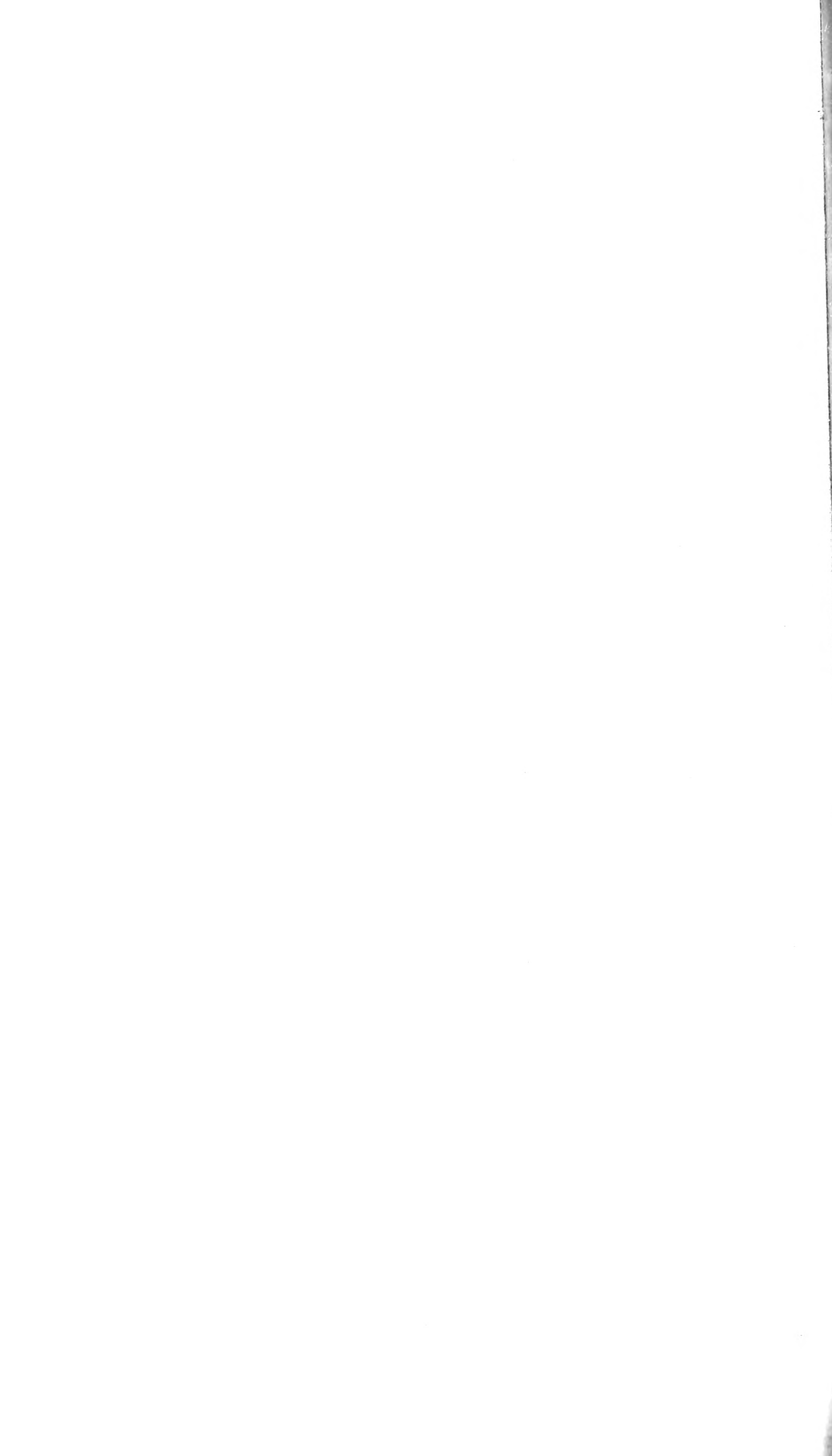
The Building Department intends to review and, if necessary, revise at least four articles each year. All articles will be reviewed and revised as necessary at least once in five years.

Use additional pages if necessary

Supporting statement:

Use additional pages if necessary

Additional copies of this form available from  
Building Department, City Hall, Room 801, Boston, Massachusetts 02201



**PERMIT APPLICATION PROCEDURE**

Proper forms should be obtained from the Building Department.

**Form BD3** or "short-form" application is designed to allow work to be done of an extremely minor non-structural nature not involving hazards to the public or to the occupants of the building. This work is limited to five hundred dollars (\$500) in the first fire district and one thousand dollars (\$1000) elsewhere. This form is rarely used.

**Form BD1** or **BD2**, the so-called "long-form" application, is for other than minor construction or alteration. Plans are required. Long-form applications must be typed. These applications necessarily take longer to be processed. The procedures are as follows:

1. Public Works Department (Room 709 City Hall) approval for sewer, water and street grade is required for new construction.
2. Fire Department approval is required for other than one- and two-family houses. The Fire Department enforces the provisions of the Fire Prevention Code. Approval is obtained from the Fire Prevention Division at 115 Southampton Street. Three sets of plans are required for approval one of which will be left at the Fire Department.
3. The Building Department requires two sets of architectural and/or engineering plans with Fire Department approval and four plot plans certified by a Massachusetts registered land surveyor. With the plot plans a completed zoning computation **Form BD534** must be submitted.
4. Plans must conform to the provisions of the Zoning Acts of 1 January 1965, as amended. Notification of non-conformance will be sent within approximately ten working days of filing. More complex buildings may take more time, simple designs less.
5. Plan Examination follows Zoning approval. Should the plan not conform to Building Law requirements, notifica-

tion will be received from a Plan Examiner. Examination requires from ten to thirty working days, dependent upon the complexity of the plans.

6. The filer of plans which fail to conform either to Zoning or Building Law has the right to appeal to the Board of Appeal. The Board will make its decision after a hearing. Access to the Board of Appeal is a right, but application must be made on the proper **Form BD504** and within the stipulated period.
7. Should the plans meet all requirements of Zoning and Building Law, or the Board of Appeal give a favorable decision, a Building Permit will be issued upon the signing of the original application by the licensing mechanic who is to be in charge of the work. If more than four sheets of plans are a part of the application, no permit shall be issued until the applicant has filed his approved plans on the Building Department microfilm format.
8. In some cases Department of Public Safety approval may be required.



## Permit Application Forms in Use.

- |                             |   |
|-----------------------------|---|
| <b>Form BD 1;<br/>BD 1A</b> | Application For Permit To Erect A Building Or Structure   |
| <b>Form BD 2;<br/>BD 2A</b> | Application For Permit To Alter Or Repair A Building Or Structure   |
| <b>Form BD 3;</b>           | Application For Permit For Demolition, Ordinary Repairs, Minor Alterations Not Involving Vital Structural Changes, To Erect A Temporary Building Or Locker, To Build A Foundation Only Or To Move A Wooden Building |
| <b>Form BD 7;</b>           | Application For Permission To Amend Plans   |
| <b>Form BD 9;</b>           | Application For Permission To Use Premises  |
| <b>Form BD 10;</b>          | Application For Permit To Do Plumbing Or To Install Automatic Sprinklers, Standpipes And Other Fire Protective Appliances   |
| <b>Form BD 13;</b>          | Application For Permit To Do Gas Fitting And/or To Install Ovens, Furnaces, Steam Boilers, Engines, Dynamos, Etc.   |
| <b>Form BD 15;</b>          | Application For Permit To Install An Elevator Or To Materially Change An Existing Elevator  |
| <b>Form BD 15 a;</b>        | Application For Permit To Alter An Existing Elevator  |
| <b>Form BD 17;</b>          | Application For Annual Test Of Elevator Or Escalator  |
| <b>Form BD 27;</b>          | Application For Permit To Perform Electrical Work   |
| <b>Form BD 27A;</b>         | Application For Permit To Perform Additional Electrical Work  |
| <b>Form BD 504;</b>         | Application To Board Of Appeal Following Decision Of The Building Commissioner  |
| <b>Form BD 534;</b>         | Zoning Computation Form Covering All New Buildings, Changes Of Occupancy, Alterations, Etc.   |



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- Watchman on building operations 1307.5
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- Weather vanes 310.1
- Welding 827.4, 827.6.2
  - Safety precautions during construction 1319.4, 1321.0
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- Wheelchair
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  - Viewing positions in theatre 418.3.4
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**INDEX TO PRINCIPAL REGULATIONS BY OCCUPANCY GROUPS**

The listings in this index are intended solely as a guide to the principal requirements for the several occupancy classifications for the convenience of those using the code. They are not necessarily the only, nor all of the requirements which must be complied with for any specific occupancy or use classification.

The text of the code shall apply in all cases with respect to any requirement. Omission of reference to any requirement herein under any specific occupancy classification shall not nullify any requirement of the code nor be construed as exempting any occupancy from such requirement where clearly applicable under the text of the code.

**OCCUPANCY GROUP A HIGH HAZARD Sec. 203.0**

Storing, manufacturing or processing potentially explosive products or materials, or highly combustible or highly flammable products or materials.

**Location and Exposure**

Table 2-1	Explosive Air-Vapor Mixtures, 402.0
Table 2-2	Grain Elevators, etc., 411.3
Protected Exterior, 302.3.3	
Restricted Locations, 400.9	
Opening Protectives, 916.3	

**Height and Area**

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**Fire Districts**

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**Mixed Occupancy**

Two (2) or more uses, 213.0	Prohibited with Assembly, Institutional and Residential, 400.9 and 418.1.1
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**Stairs and Exitways**

General Requirements, 611.0	Capacity, 610.0
Boiler Rooms, 400.6	Horizontal Exitways, 616.0
Occupancy Load, 608.0	Enclosures, 618.9.2
Location, 609.0	Access to Roof, 619.0

**Vertical Openings**

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## Special Hazards

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Special High Hazards, 400.2  
Boiler and Equipment Rooms,  
400.6 and 1115.2

Segregation of Storage  
Spaces, 400.8  
Firestopping, 921.0  
Flammable Vapor Systems,  
1122.0  
Truck Loading and Shipping  
Areas, 905.5  
Volatile Flammables 403.0  
Pyroxylin Plastics 408.0  
Combustible Dusts 411.0  
Paint Spraying 412.0

## Light and Ventilation

Toilet Rooms, 509.2  
Shafts, 516.0  
Light & Elec. Wiring 400.5

Plastic Glazing Limitations, 2004.0

## Fire Protection

General Requirements, 400.7  
Standpipes, 1207.0 & 1209.0  
Sprinklers, 1213.0

Special Fire Protection, 1217.0  
Fire Alarms, 1219.0

## Exceptions and Deviations

General Exceptions, 400.0

One Story Building Roof Construction,  
Table 2-1 note 4

## Existing Buildings

Alterations, 106.0  
General Requirements, 306.0  
and 406.0  
Light and Ventilation, 506.0  
Exits, 606.0 and 607.0  
Posting of Buildings, 706.0  
Exhaust Opening, 1806.0

Chimneys and Flues, 1006.0  
and 1011.3.6  
Heating Equipment Maintenance,  
1106.0  
Fire Service Equipment, 1205.0  
and 1206.0  
Protection of Adjacent Property,  
1306.0

## OCCUPANCY GROUP B-1 MODERATE HAZARD STORAGE Sec. 204.1

Flammable or combustible materials likely to permit the development and propagation of fire with moderate hazard but not producing either poisonous gases, fumes or explosives. Includes group 1 public garages.

### Location and Exposure

Table 2-1  
Opening Protectives, 916.0

### Height and Area

Table 2-2  
General Requirements, 307.0  
and 308.0  
Unlimited Area, 309.0

Garages, 415.1.1  
Open Parking Structures, 905.2  
Petroleum Storage Buildings, 905.3

### Fire Districts

Frame Construction — Prohibited  
in First Firezone, 302.5

Bulk Storage 303.2.6  
Boat Houses, 304.2.4  
Roof Structures, 927.0  
Plastics, 2003.0 and 2004.0



## Mixed Occupancy

Two (2) or more uses, 213.1  
and 213.1.2

Garage Separation, 415.1.2  
Exitways, 603.2  
Roof Storage of Motor Vehicles  
415.1.3  
Private Garages 414.0

## Stairs and Exitways

Unlimited One Story Buildings,  
604.0  
General Requirements, 611.0  
Occupancy Load, 608.0  
Capacity, 610.0

Location, 609.0  
Horizontal Exitways, 616.0  
Enclosures, 618.9.2  
Access to Roof, 619.0

## Vertical Openings

Same as Occupancy Group A

## Special Hazards

Basements of Dry Cleaning  
Plants, 413.2.5  
Heating—Dry Cleaning  
Plants, 413.3  
Heating—Garages 415.4  
and 415.5

Window Safety Hooks, 523.0  
Firestopping, 921.0  
Boiler Rooms, 1115.0  
Garages—Flammable Solvent, 415.3

## Light and Ventilation

Dry Cleaning Plants, 413.4  
Garages, 415.2, 415.1.2  
Toilet Rooms, 509.2

Truck Loading and Shipping  
Areas, 905.5  
Shafts, 516.0  
Plastic Glazing, 2003.0 and 2004.0

## Fire Protection

Dry Cleaning Plants, 413.7  
Sprinklers, 1213.0

Standpipes, 1207.0 and 1209.0  
Open Parking Structures 905.5

## Exceptions and Deviations

Height Exceptions, 310.0

Private Garages 303.2.3

## Existing Buildings

Converted to Public Garages,  
Motor Vehicle Repair Shop,  
Gasoline Service Station,  
905.1  
General Requirements, 306.0  
and 406.0  
Light and Ventilation, 506.0  
Exitways, 606.0 and 607.0  
Posting of Buildings, 706.4  
Chimneys and Flues, 1006.0  
and 1011.3.7

Heating Equipment Maintenance,  
1106.0  
Fire Service Equipment  
1205.0 and 1206.0  
Protection of Adjacent Property,  
1306.0  
Refrigerating, Air Conditioning,  
Ventilating Equipment, 1806.0

## OCCUPANCY GROUP B-2 LOW HAZARD STORAGE Sec. 204.2

Non-combustible materials and materials that do not ordinarily burn rapidly.  
Private garages, group 2 public garages, greenhouses, warehouses.

## Location and Exposure

Table 2-1

Opening Protectives, 916.0

**Height and Area**

Table 2-2  
 Unlimited Area, 309.0

General Requirements, 307.0  
 and 308.0

**Fire Districts**

Frame Construction Prohibited  
 in First Firezone, 302.5

Roof Structures, 927.0  
 Plastics, 2003.0 and 2004.0

**Mixed Occupancy**

Two (2) or more uses, 213.1  
 and 213.1.2

Prohibited Uses, 413.2.2  
 Exitways, 603.2

**Stairs and Exitways**

Same as Occupancy Group B-1

**Vertical Openings**

Same as Occupancy Group A

**Special Hazards**

Window Safety Hooks, 523.0

Firestopping, 921.0  
 Truck Loading and Shipping  
 Areas, 905.5

**Light and Ventilation**

Toilet Rooms, 509.2  
 Shafts, 516.0

Plastic Glazing, 2003.0 and 2004.0

**Fire Protection**

Standpipes, 1207.0 and 1209.0    Sprinklers, 1213.0

**Exceptions and Deviations**

Height Exceptions, 310.0

**Existing Buildings**

Same as Occupancy Group B-1

**OCCUPANCY GROUP C MERCANTILE BUILDINGS Sec. 205.0**

Display and sales of goods accessible to public inspection  
 Limited quantities of highly combustible or flammable goods  
 Retail stores, shops, salesrooms, markets, public auction rooms

**Location and Exposure**

Table 2-1

Opening Protectives, 916.0

**Height and Area**

Table 2-2

General Requirements, 307.0  
 and 308.0  
 Unlimited Areas 309.0

**Fire Districts**

Same as Occupancy Group B-2

**Mixed Occupancy**

Two (2) or more uses, 213.1  
 and 213.1.2

Exitways, 603.2

**Stairs and Exitways**

Same as Occupancy Group B-1  
 except for "Unlimited One Story  
 Buildings"

**Vertical Openings**

Same as Occupancy Group A

**Special Hazards**

Window Safety Hooks, 523.0  
Firestopping, 921.0

Packing and Shipping Rooms, 905.4

**Light, Heat and Ventilation**

Toilet Rooms, 509.2  
Shafts, 516.0  
Plastic Glazing, 2003.0  
and 2004.0

General, 503.0, 504.0, 505.0  
Windowless Buildings, 521.0

**Fire Protection**

Standpipes, 1207.0 and 1209.0  
Sprinklers, 1213.0  
Fire Alarms, 1219.1.5

**Exceptions and Deviations**

Height Exceptions, 310.0

Combustible Partitions, 910.4

**Existing Buildings**

Same as Occupancy Group B-2

**OCCUPANCY GROUP D INDUSTRIAL BUILDINGS Sec. 206.0**

D-1 Fabrication, assembly, manufacturing or processing with moderate fire hazard: baking plants, breweries, motor vehicle repair shops, foundries, heliports, scenery shops, mod. hazard dry cleaning, see also RS 2-1

D-2 Low hazard: mechanical and electrical equipment rooms, commercial laundries, vocational training shops, laboratories, boiler and furnace rooms, nonresidential kitchens, power plants, low hazard dry cleaning, see also RS 2-1

**Location and Exposure**

Table 2-1

Opening Protectives, 916.0

Motor Vehicle Repair Shops, 417.0

**Height and Area**

Table 2-2  
Unlimited Area, 309.0

General Requirements, 307.0  
and 308.0

Special Uses Requiring Large Areas  
and Heights, 206.3

**Fire Districts**

Same as Occupancy Group B-2

**Mixed Occupancy**

Same as Occupancy Group C

Also: Dry Cleaning Establishment  
Restrictions, 413.2

**Stairs and Exitways**

Same as Occupancy Group B-1

**Vertical Openings**

Same as Occupancy Group A

**Special Hazards**

Window Safety Hooks, 523.0

Firestopping, 921.0

Truck Loading and Shipping  
Areas, 905.5

Motor Vehicle Repair Shops, 417.0

Dry Cleaning, 413.0

**Light, Heat and Ventilation**

Toilet Rooms, 509.2

Shafts, 516.0

Windowless Buildings, 517.0  
521.0

Plastic Glazing, 2003.0 and 2004.0

General, 503.0, 504.0, 505.0

Motor Vehicle Repair Shops, 417.3

**Fire Protection**

Fire Vents, 521.0

Standpipes, 1207.0

Sprinklers, 1213.0

Fire Alarms, 1219.1.6

Motor Vehicle Repair Shops, 417.4

**Exceptions and Deviations**

Height Exceptions, 310.0

Special Uses, 400.0 and 905.0

Combustible Partitions, 910.4

**Existing Buildings**

Same as Occupancy Group B-2

**OCCUPANCY GROUP E BUSINESS BUILDINGS Sec. 207.0**

Office buildings, banks, civic administration buildings, radio and television stations, telephone exchanges, barber and beauty shops, automotive service stations.

**Location and Exposure**

Table 2-1

Opening Protectives, 916.0

**Height and Area**

Table 2-2

General Requirements, 307.0  
and 308.0

Unlimited Area, 309.0

Motor Fuel Service Station, 416.0

**Fire Districts**

Same as Occupancy Group B-2

**Mixed Occupancy**

Two (2) or more Uses, 213.1  
and 213.1.2

Exitways, 603.2

With Residential, 905.6.3

**Stairs and Exitways**

Same as Occupancy Group B-1

**Vertical Openings**

Same as Occupancy Group A

**Special Hazards**

Window Safety Hooks, 523.0

Truck Loading & Shipping Areas,  
905.5

Firestopping, 921.0

**Light, Heat and Ventilation**

Same as Occupancy Group D

## Fire Protection

Standpipes, 1207.0 and 1209.0    Fire Alarms, 1219.1.7  
Sprinklers, 1213.0

## Exceptions and Deviations

Height Exceptions, 310.0                      Combustible Partitions, 910.4  
One Stairway Required,  
611.3.2

## Existing Buildings

Same as Occupancy Group B-2

## OCCUPANCY GROUP F-1 ASSEMBLY THEATRES Sec. 208.1

F-1a with scenery, theatres, playhouses, opera houses

F-1b no scenery, motion picture theatres, convention halls, concert halls,  
sports arenas, planetariums

## Location and Exposure

Table 2-1    Street Frontage, 418.1.4  
Restricted Location, 400.9                      Opening Protectives, 916.3.2

## Height and Area

Table 2-2    General Requirements, 307.0 and  
308.0

## Fire Districts

Roof Structures, 927.0                              Plastics, 2003.0 and 2004.0

## Mixed Occupancy

Two (2) or more uses, 213.1                      Prohibited with High Hazard  
Exitways, 603.2                                      Occupancy, 400.9, 418.1.1

## Stairs and Exitways

General Requirements, 418.2                      Location, 609.0  
and 611.0    Capacity, 610.0  
Seating Requirements, 418.3                      Horizontal Exitway, 616.0  
Panic Hardware, 614.5.2                              Enclosures, 618.9.2  
Occupancy Load, 608.1                              Access to Roof, 619.0

## Vertical Openings

Shafts, 516.0    Enclosures, 911.0

## Special Hazards

General Requirements, 418.0                      Firestopping, 921.0  
Flammable Film, 409.0                              Interior Finish, 922.1  
Stage Construction, 418.6                              Boiler Rooms, 1115.0  
Below Grade Occupancy,  
905.7.4    F-3 Also: General Requirements 419.0

## Light, Heat and Ventilation

Artificial Lighting, 418.8                              General, 503.0, 504.0, 505.0  
and 627.0    Plastic Glazing, 2003.0 and 2004.0  
Toilet Room, 509.2  
Shafts, 516.0

## **Fire Protection**

Sprinklers and Standpipes,  
418.9, 1207.0, 1209.0  
and 1213.0

## **Existing Buildings**

Same as Occupancy Group B-2; Continued Use, 418.1.6  
also:  
Shaftways, 911.7

## **OCCUPANCY GROUP F-2 ASSEMBLY Sec. 208.2**

Persons physically active: restaurants, night clubs, cabarets, dance halls, ballrooms, banquet rooms, cafeterias, snack bars, taverns, coffee houses

## **OCCUPANCY GROUP F-3 ASSEMBLY Sec. 208.3**

Exhibition halls, art galleries, museums, gymnasiums, lecture halls, passenger terminals, bowling alleys, billiard parlors, skating rinks, recreation centers, funeral establishments

## **Location and Exposure**

Same as Occupancy Group F-1

## **Height and Area**

Same as Occupancy Group F-1  
Except F-3 Unlimited Areas 309.1

## **Fire Districts**

Same as Occupancy Group F-1

## **Mixed Occupancy**

Same as Occupancy Group F-1

## **Stairs and Exitways**

Same as Occupancy Group F-1  
except for "Seating Requirements"  
Same as Occupancy Group F-2

## **Vertical Openings**

Same as Occupancy Group F-1

## **Special Hazards**

General Requirements, 419.0	Exhibition Areas, 419.9
Basement Occupancy, 905.7.4	Flammable Film, 409.0
Firerestopping, 921.0	Bowling Alleys, 419.7
Interior Finish, 922.1	Skating Rinks, 419.8
Boiler Rooms, 1115.0	
Kitchens, 419.6	
Aisles for Tables and Chairs, 419.3	

## **Light and Ventilation**

Same as Occupancy Group F-1

**Fire Protection**

Sprinklers, 1213.0 F-3 also 418.9  
Standpipes, 1207.0  
and 1209.0

**Exceptions and Deviations**

Sec. 419.0

**Existing Buildings**

Same as Occupancy Group F-1

**OCCUPANCY GROUP F-4 ASSEMBLY Sec. 208.6**

Libraries, churches

**OCCUPANCY GROUP G EDUCATIONAL BUILDINGS Sec. 208.6**

Schools, academies, universities, colleges

**Location and Exposure**

Same as F-1, except Churches,  
916.0

**Height and Area**

Same as Occupancy Group F-1

**Fire Districts**

Roof Structures, 927.0 Frame Construction  
Plastics, 2003.0 and 2004.0 Prohibited, 302.5

**Mixed Occupancy**

Same as Occupancy Group F-1

**Stairs and Exitways**

Same as Occupancy Group F-2

**Vertical Openings**

Same as Occupancy Group F-1

**Special Hazards**

Flammable Film, 409.0 Interior Finish, 922.1  
Basement Occupancy, 905.7.4 Boiler Rooms, 1115.0  
Firestopping, 921.0

**Light and Ventilation**

Same as Occupancy Group F-1

**Fire Protection**

Standpipes, 1207.0 and 1209.0 Alarm Systems (School), 1219.1.4  
Sprinklers, 1213.0

**Exceptions and Deviations**

Auditoriums and Gymnasiums, Church Auditoriums—Table 2-2  
915.2 note 1  
Church Side Aisles, 612.3

**Existing Buildings**

Same as Occupancy Group F-1

**OCCUPANCY GROUP F-5 OUTDOOR ASSEMBLY Sec. 208.5, 422.0**

Grandstands, bleachers, coliseums, stadiums, drive-in theatres, tents

**OCCUPANCY GROUP H INSTITUTIONAL BUILDINGS Sec. 209.0**

H-1 detention under restraint, jails, prisons, reformatories, mental institutions, cell areas of police stations

H-2 hospitals, sanitariums, clinics, nursing homes, orphanages, homes for the aged, day nurseries

**Location and Exposure**

Table 2-1

Restricted Location, 400.9

**Height and Area**

Table 2-2

General Requirements, 307.0  
and 308.0

**Fire Districts**

Roof Structures, 927.0

Plastics, 2003.0 and 2004.0

**Mixed Occupancy**

Two (2) or more uses, 213.1  
and 213.1.2

Prohibited with High Hazard  
Uses, 400.9 and 413.2.1  
Exitways, 603.2

**Stairs and Exitways**

General Requirements, 611.0  
Enclosure, 618.9.2  
Fire Escapes, 624.0  
Location, 609.0  
Capacity, 610.0

Horizontal Exitway, 616.0  
Interior Stairways, 618.0  
Access to Roof, 619.0  
Doors 612.4.1  
Corridors, Length Between Smoke  
Barriers, 612.3.3

**Vertical Openings**

Shafts, 516.0  
Enclosures, 911.0

**Special Hazards**

Flammable Film, 409.0  
Revolving Doors, Prohibited,  
615.1.1  
Scaffolding During Repair,  
1315.2

Firestopping, 921.0  
Interior Finish, 922.1  
Boiler Rooms, 1115.0  
Incinerators, 1015.0, 1138.0  
and 1139.0  
Transoms and Louvres, Restricted,  
612.4.1

**Light, Heat and Ventilation**

Rooms, 503.0, 504.0, 505.0,  
512.0  
Bathrooms, 509.2  
Courts, 518.0, 520.0

Shafts, 516.0  
Plastic Glazing, 2003.0 and 2004.0

**Fire Protection**

Fire Alarms, 1219.1.2,  
1219.1.3  
Sprinklers, 1213.0  
Standpipes, 1207.0, 1209.0

Fire Emergency Exhaust Systems  
521.0



**Existing Buildings**

Same as B-2, also:  
Shaftways, 911.7

**OCCUPANCY GROUP L-1 RESIDENTIAL, TRANSIENT Sec. 210.1**

Hotels, motels, lodging houses, rooming houses

**OCCUPANCY GROUP L-2 RESIDENTIAL Sec. 210.2**

Three or more dwelling units, month-to-month or longer term apartment houses, school dormitory buildings, college fraternity and sorority houses

**Location and Exposure**

Table 2-1

**Height and Area**

Table 2-2  
General Requirements, 307.0  
and 308.0

Protected Construction, L-2, 905.6

**Fire Districts**

Roof Structures, 927.0

Plastics, 2003.0 and 2004.0

**Mixed Occupancy**

Two (2) or more uses, 213.1

Prohibited with High Hazard Use, 400.9 and 413.2.1  
Private Garages, 414.0  
Retail Occupancy, 905.6.3  
Exitways, 603.2

**Stairs and Exitways**

Same as Occupancy Group H-1

One Exitway (L-2), 611.3.1  
Exterior Exitway Stairways, 621.0  
Balconies (L-2), 612.7

**Vertical Openings**

Same as Occupancy Group H-1

**Special Hazards**

Firestopping, 921.0  
Interior Finish, 922.1  
Boiler Rooms, 1115.0

Incinerators, 1015.0, 1138.0  
and 1139.0  
Air Recirculation, 1119.7

**Light, Heat and Ventilation**

Same as Occupancy Group H-1  
except: Rooms 512.0

**Fire Protection**

Fire Alarms, 1219.1.1  
Sprinklers, 1213.0

Standpipes, 1207.0 and 1209.0  
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611.4

Private Garages, 414.0  
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**Existing Buildings**

Same as Occupancy Group H-1,  
also: Stair Enclosures,  
606.3.2

Wood Surface Preservatives,  
855.5, 876.0

## **OCCUPANCY GROUP L-3 RESIDENTIAL Sec. 210.3**

One- and two-family dwellings, rectories, convents

### **Location and Exposure**

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Table 2-2

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Firestopping, 921.0

Air Recirculation, 1119.7

### **Light, Heat and Ventilation**

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2004.0

### **Fire Protection**

Firestopping, 921.0

### **Exceptions and Deviations**

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### **Existing Buildings**

Wood Surface Preservatives,  
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**OCCUPANCY GROUP M MISCELLANEOUS Sec. 211.0**

Sheds, fences, signs

General Requirements, 211.0

Ratproofing, 875.0

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Signs, Article 14









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